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TRANSACTIONS

OF THE

TWENTY-FIFTH ANNUAL MEETING

OF THE

American  
Academy of Ophthalmology  
and Oto-Laryngology

1920

HELD AT

KANSAS CITY, MO.

OCTOBER 14, 15, 16, 1920

The Twenty-sixth Annual Meeting of the American Academy of Ophthalmology and Oto-Laryngology will be held at Philadelphia, Pa., October 17, 18 and 19, 1921. An intensive course in Ophthalmology and Oto-Laryngology will be given October 20, 21 and 22.

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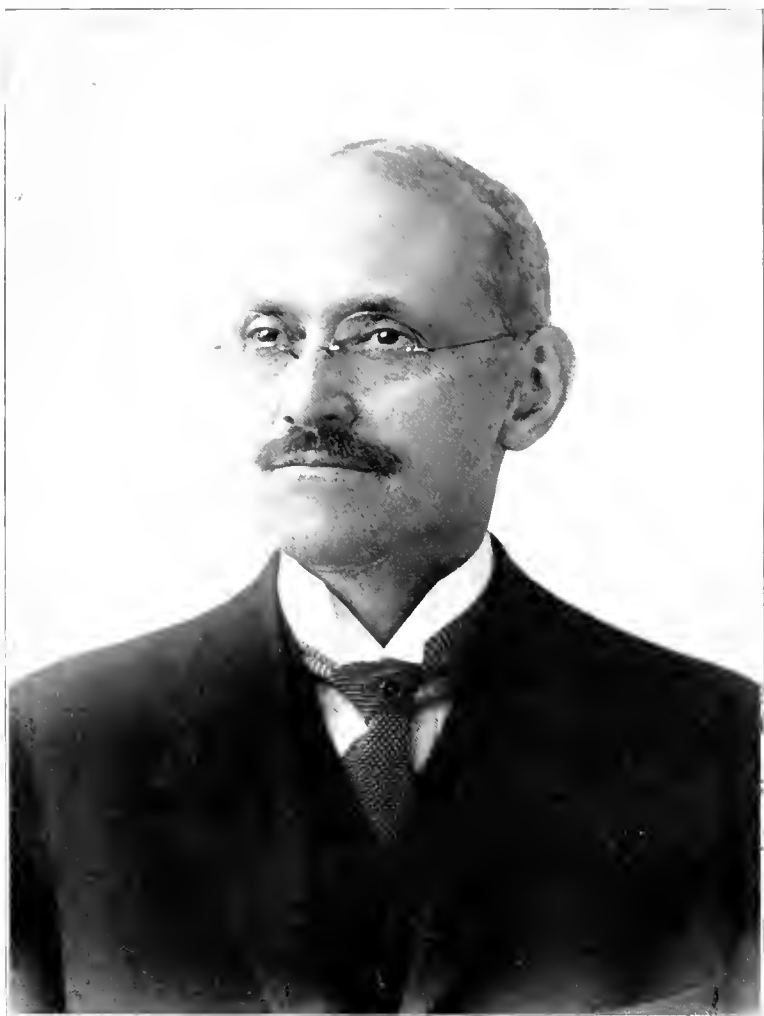
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Born, Franklin, Ohio, October 2, 1864. Graduated, Miami Medical College, 1890. Practiced, Cincinnati, 1890-. President of the Academy, 1908.





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Practiced, Philadelphia. President of the Academy, 1910. Died, 1916.



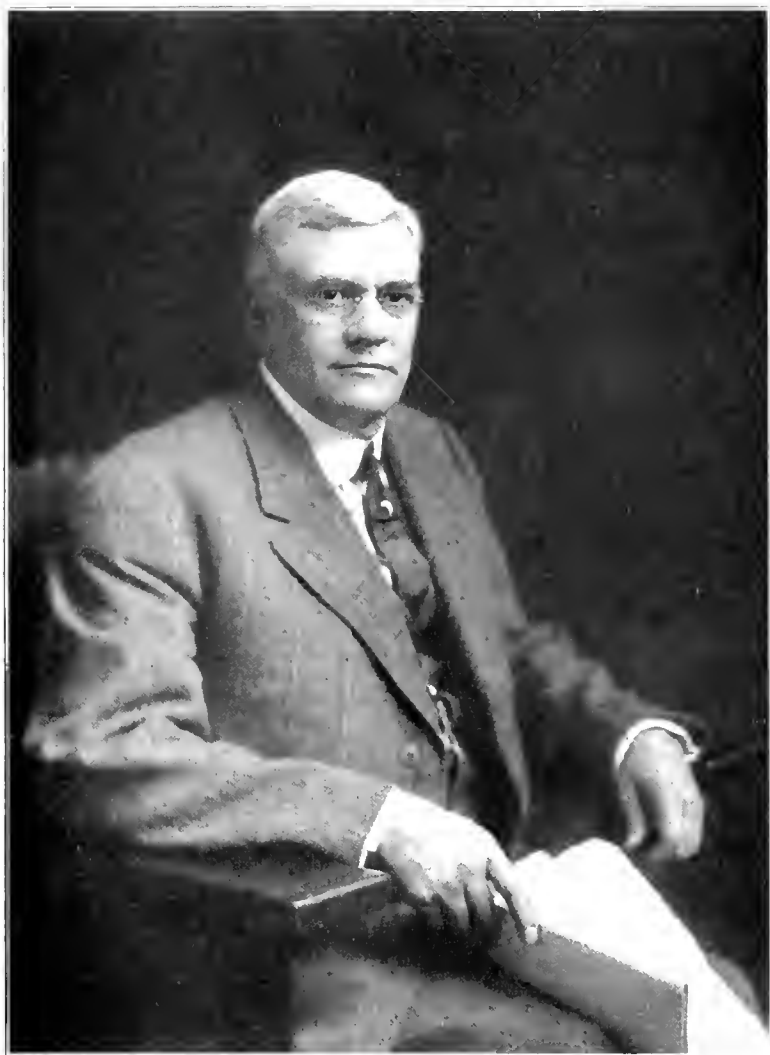
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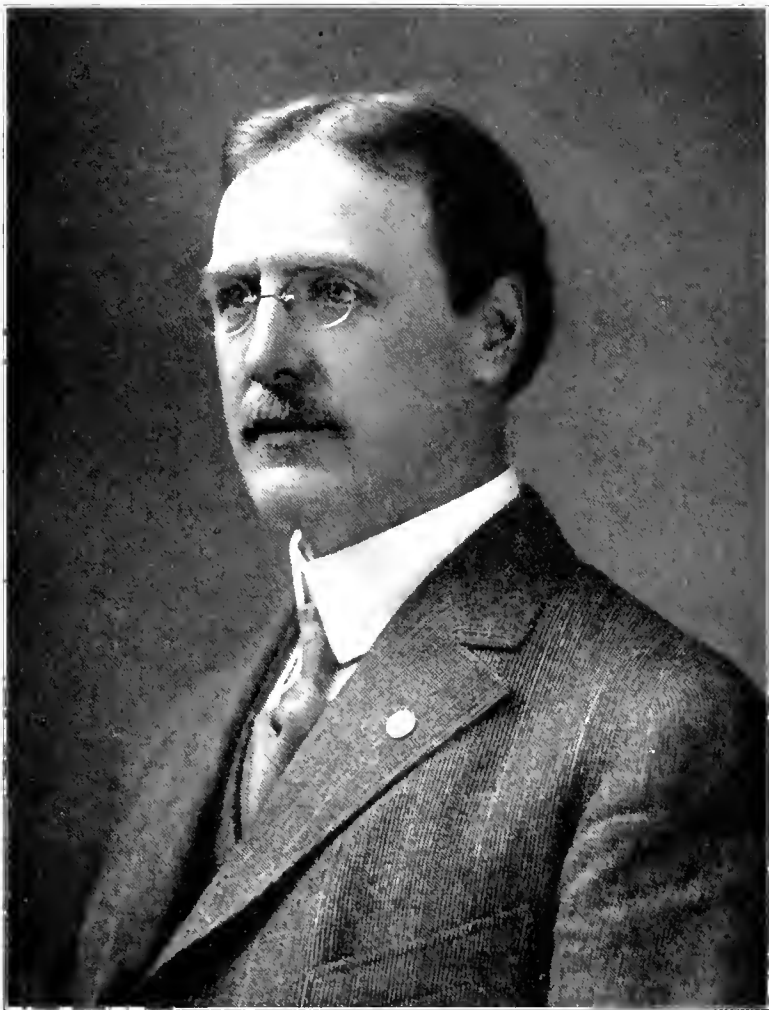
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Born at Princeton, Illinois, March 22, 1857. Graduated Chicago Medical College, Medical Dept. Northwestern University, March, 1881. Practiced in Englewood, 1881; Lincoln, Nebraska, 1881-. President of the Academy, 1917.



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Born, March 1, 1860. Graduated Harvard Medical School, 1890.  
Practiced Boston, 1889-. President of the Academy, 1918.



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Born, Youngstown, Ohio, March 11, 1869. Graduated Medical Dept.  
Western Reserve University, 1893. Practiced in Cleveland, Ohio, 1893-  
President of the Academy, 1919.



DR. LEE MASTEN FRANCIS

Born at Sabinsville, Pa., October 8, 1877. Graduated, Rush Medical College, 1901. Practiced at Buffalo, 1904-. President of the Academy, 1920.

# JOINT SESSIONS

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JOINT SESSIONS



## PRESIDENT'S ADDRESS

LEE MASTEN FRANCIS, M.D.

BUFFALO, N. Y.

Fellows of the Academy: It is absolutely beyond my powers to express my profound appreciation of the supreme honor you have done me in choosing me as your president. I am thoroughly sensible of the tribute and justly proud of the distinction.

However, I can more adequately voice the acknowledgement of the debt all of us owe to the Secretary—and to our cofounder, Dr. Foster, and those loyal Kansas City members who have labored long and painstakingly to make this silver anniversary a success.

During the twenty-five years of its existence, the Academy has grown from a weakling to the largest, strongest and most powerful organization of its kind in America, if not in the world. The Academy has always stood for, and always shall stand for uplift. Many great movements looking to the betterment of the head specialists have had their beginnings here, and all have had our loyal support and encouragement. I have but to mention the rôle the Academy has played in the publication of special literature, in the establishment of boards of special examinations and particularly in the fund we are now accumulating for the purpose of research.

The Academy has always been an every man's society and never a holier-than-thou organization. The young man is welcomed, encouraged in his first steps forward, guided on his way, and led back should he leave it.

The Academy is the training and proving ground for Ophthalmology and Oto-Laryngology.

I have no formal address, but there are two suggestions which I should like to have considered at this time, when our Constitution is being altered:

First: The Academy has grown to such proportions that its business executive, the Council, is a very much occupied body. As Dr. Large has pointed out, a large part of its time is consumed in considering the candidates for fellowship. As wide spread as are our activities, it is increasingly difficult to obtain desired information concerning individuals. As a remedy I beg to suggest that some provision be incorporated into our By-Laws which shall

require that the names of all candidates for fellowship shall be in the Secretary's hands thirty days before the meeting, and that a list of applicants shall be sent out with the program; and that members be urged to inform the Council forthwith of adverse criticism.

The second suggestion relates to the time of meeting. I voice my personal opinion in saying that October is an ill-chosen month. It is difficult for many of us to leave our several duties at this time, and especially is this true of those who teach. Contributors to the program must many times prepare their material during their vacation, and there are many other obvious objections.

I believe that if a definite time must be selected, the ideal season is between December 10th and 20th, when there are fewer demands upon our time, no other meetings scheduled, and when a few days' respite is most welcome after these busy months.

We do not forget that during the past year the Academy has lost three former presidents. Its first and second presiding officer, Adolph Alt, seriously ill during the Cleveland meeting, has since been gathered to his fathers. And with him Christian R. Holmes, the seventh president, and John J. Kyle, the sixteenth president.

May they rest in peace.

We remember them.

We appreciate them.

We honor them.

We miss them.

## OCULAR SYMPTOMS DUE TO INTRANASAL DISEASE

A. J. LORIE M.D. AND J. S. LICHTENBERG M.D.  
KANSAS CITY, MO.

The interdependence of certain affections of the eye and diseases of the nasal accessory sinuses has been well known for many years. Many of the standard text books—such as Fuch's, Weeks, Axenfeld and others—have paragraphs on the subject. There has been so much literature in later years upon this work that a review would be both tiresome and useless.

It is, however, the purpose of this paper to emphasize the early diagnosis of this class of cases. We wish to call attention to, and to emphasize the necessity for a careful examination of the blind spot areas of the fields. In our experience, a slight enlargement of this area is the earliest ocular symptom. This is sometimes very difficult to elicit and may require several examinations in order to educate the patient to give reliable answers; also, in our experience, it is only in exceptional cases that the color areas are necessary. The  $2\frac{1}{2}$  mm. white test object and Peter's campimeter are, as a rule, quite sufficient. A busy man, especially one working without trained assistants, has hardly the time to give to this work; also, this work is so comparatively recent, that many ophthalmologists do not realize its importance. It is only since the article of van Der Hoeve appeared that the measurement of the blind spot area has been important. Van Der Hoeve's work has been confirmed by Gjessing, de Kleijn, Peter, Gradle and others. Of course, in measuring the blind spot area, the apparatus described by Gradle is much more accurate, but for rapid clinical work, we have found the campimeter of Peter is all that is necessary. We have not used the Bjerrum screen.

In the symptomology, we have all degrees and grades from slight asthenopia, for which the patient goes from one to another for the correction of a supposed error of refraction or muscular unbalance, to complete blindness; from cases with no ophthalmoscopic changes to those which show marked intraocular changes, such as pallor of the temporal sector (macular bundle), to complete atrophy. We are not including the orbital phlegmons of nasal origin in this report.

We wish to report from a series of twenty-five cases a few

illustrating the different conditions found, and those that showed unusual difficulties. All of these cases were worked out in conjunction with Dr. Lichtenberg, who performed all eye examinations, diagnosis and reports. The X-ray examinations and reports were by Dr. Donaldson, while the nasal examination and surgery were performed by myself. All cases had a complete physical, laboratory and X-ray examination, which we will consider as negative unless reported otherwise, for the sake of brevity.

CASE 1.—Mrs. W. C., age 52, Tulsa, Oklahoma, March 31, 1919.

L. E. Blind since last fall. R. E. Began to fail about two months ago. Has been having headaches about noon daily—has high blood pressure.

V. R. 10/200, pin hole, and lenses do not improve. V. L. Light perception. R. Shows hemorrhagic retinitis. L. Shows exudate into vitreous—fundus cannot be seen.

Wassermann and urine negative. Blood pressure (systolic), 185.

Mouth. Tonsils atrophic—all teeth have been removed.

Nose. Septum deflection to right, with long shelving spur in contact with the posterior  $\frac{1}{4}$  of middle turbinate. Right middle turbinate impacted against the lateral wall with a hyperplasia of the mucous membrane around the bulla—no pus, polyps. X-ray shows cloud in right ethmoid.

Operation—submucous resection and right ethmoid.

Ethmoid—posterior—full of small polyps and infected granulations.

Discharged four weeks later. V. R. 20/100 with  $+1.00 \text{ C} +0.50 \text{ axis } 180$ . V. L. Not improved.

CASE 2.—H. J., Feb. 17, 1919, age 23, Lieut. U. S. A.

History: August 1st. Previously, while in France, noticed black spots before left eye. Was tested at various army hospitals before coming to us, but vision became steadily worse. Now noticed R. eye is slightly affected.

Examination: V. R. 20/20. V. L. 20/200—not improved by pin hole or lenses.

Ophthalmoscope shows a few small floating opacities in the right vitreous, with the disc margins not well outlined, vessels full and slightly tortuous. In the left eye, numerous large and fine floating opacities in vitreous, also dust-like exudation into vitreous. Fundus cannot be seen clearly, but disc margins are

blended with the surrounding retina and elevated about 1 to 2D. The retina is edematous.

X-ray of teeth and sinuses negative. The fields show a slight concentric contraction for colors. The R. blind spot is enlarged, the vision of the left being too poor to take the blind spot area accurately.

Throat—negative, tonsils have been removed.

Nose—spur of septum to right, contact inferior turbinate. Deflection of perpendicular plate to left. Turbinates—left middle, polypoid degeneration. Middle meatus full of pus from ethmoid. Right middle fossa full of small polyps.

Diagnosis—Purulent ethmoiditis.

Operation—submucous resection and ethmoid (both). July 31, 1919. V. R. 20/20. V. L. 20/60+

The media of the right eye were clear except for some fine floaters in the vitreous. Retina and disc normal. The left vitreous still shows some coarse and fine floating opacities. The edges of the disc slightly veiled and the disc pale.

CASE 3.—A. E. P., male, Bushong, Kansas, age 39, blacksmith, November 16, 1918.

Has always seen well and has had no eye trouble of any kind until six weeks ago, since which time vision has failed rapidly in both eyes. Slight pain back of eyes during the last few days.

Examination: V. R. 20/200. V. L. 10/200; lenses negative. Eyes normal, except that the discs are a trifle pale in the temporal side. Fields show a concentric contraction of both form and color. Central scotoma for yellow and green. Blind spot difficult to map out, but seems to be decidedly enlarged.

All examinations negative. X-ray negative as to teeth and sinuses.

Nose—Septum straight, mucous membrane normal in color, no pus or crusting. Turbinates free and normal in appearance.

From previous experience, an exploration of both ethmoids was performed, with the finding of a hyperplastic posterior ethmoid on both sides; these were completely removed.

February 15, 1918. V. R. 15/15, with  $+ 0.75 = 15/15$ . V. L. 15/15,  $+ 0.75 = 15/15$ . Fields fairly normal and no central scotoma.

CASE 4.—Mrs. G. P., Kearney, Kansas, age 46, March 31, 1919.

History: Left eye has a spot before it and cannot see well out of same. Noticed it first during hot weather last summer. Came on suddenly. Has had considerable treatment by local physicians.

Examination: V. R. 20/20. V. L. 20/150—lenses negative. Eyes are perfectly normal and no change can be seen in the fundi except a possible paleness of left disc. Fields—R., normal; L., shows a slight contraction for colors. Left blind spot, enlarged. X-ray shows cloud in left antrum, frontal and ethmoid, with heaviest cloud in posterior ethmoid. Teeth negative.

Nose—shows septum straight. Left middle turbinate bathed in pus, with considerable polypoid degeneration.

Operation—Radical ethmoid and antrum—both full of polyps, pus, and infected granulations.

June 12, 1919. V. R. 20/20  $\pm$  0.25 = 20/20. V. L. 20/60  $\pm$  1.50 = 20/30. Left fields and disc are about the same as when first seen.

CASE 5.—Mrs. G. Y., Westphalia, Kansas, April 12, 1919, 20 years.

History: Has had difficulty in using the eyes all winter, but has grown very much worse in last three weeks. Has been trying to obtain satisfactory glasses for four years. Had them changed last fall.

V. R. 4/200, lenses negative. V. L. 20/30,  $\pm$  0.62 axis 90 = 20/20. Eyes are normal with exception of paleness of disc of R. Field shows concentric contraction for form and color. Positive central scotoma. L. field normal. Blind spot enlarged—both sides.

Examination—negative. X-ray—cloud posterior ethmoid and sphenoid.

Nose—mucopurulent secretion posterior ethmoid and sphenoid; polypoid degeneration, posterior and middle turbinate, otherwise negative.

Operation—sphenoid and ethmoid; polyps in ethmoid cells, thickened sphenoid mucous membrane.

August 8, 1919. V. R. 20/20 with  $\pm$  2.50. V. L. 20/20 with  $\pm$  0.50 axis 90. R. disc still pale.

CASE 6.—A. B., 28, Nevada, Missouri, March 18, 1918.

History: Was a musician in army in France. Noticed R. eye began to blur six months ago. Has been examined on various occasions in army hospitals with no diagnosis and no benefit from treatment. V. of R. eye steadily growing worse.

Examination: V. R. 10/200, pin hole negative. V. L. 20/20. Fundus of right shows no marked changes. Fields for form about normal and for colors somewhat contracted, 4 mm. test object. All examinations negative.



Nose shows absolutely negative to all examinations. X-ray negative.

Dr. Lichtenberg again went over eyes only to confirm previous examination, and insisted upon exploration of nasal sinuses. Operation begun on exploration of right ethmoid, as most likely seat. The entire posterior ethmoid completely filled with a large mucocele—left ethmoid negative.

Six weeks later—vision in right eye 20/20.

CASE 7.—W. F., male, age 27, motorman, October 16, 1917.

History: Has difficulty in using eyes, especially in reading. Has tried a number of times to obtain glasses but none have given relief. Has also tried various colored lenses.

Examination: V. R. 20/20; under homatropin  $+ 0.20 \times 90 = 20/20$ . V. L. 20/20 under homatropin  $+ 0.25 \times 90 = 20/20$ . Muscles show an exophoria of  $1^\circ$  at 20 ft. Fundi and fields normal—blind spots enlarged.

Nose. Fractured septum, in tight contact with both middle turbinates. Polypoid degeneration of both posterior ends of middle turbinates.

Operation: Submucous resection—double ethmoid, hyperplastic ethmoids.

60 days later—eyes comfortable, no glasses.

CASE 8.—R. E. C., Concordia, Kansas, age 47, photographer.

History: Eyes weak and has pain. Feels dizzy—has difficulty in use of eyes in the near point.

Examination: V. R. = 20/20,  $+ 0.25$  axis 120 = 20/20. V. L. = 20/20,  $+ 0.25$  axis 135 = 20/20. No muscle unbalance. With  $+ 1.0$  added reads Jäger 1, after one hour's trial in office. The glasses were not comfortable, so fields were taken and found normal. Blind spot area found enlarged.

Nose: Shows high deflection to right. Chronic nonsuppurative ethmoiditis, both sides.

Operation: Bilateral ethmoid.

Four weeks after operation patient read comfortably, with presbyopic correction.

We have selected these cases out of a series of twenty-five, for their typical findings, illustrating the various ocular and nasal groupings. We have here frank, suppurating sinusitis; hyperplastic ethmoiditis; chronic nonsuppurative sinusitis and infections, revealed only upon exploration, with an entire absence of visible nasal pathology.

Our experience leads us to believe that the majority of these

low grade infections rests in the posterior ethmoid, instead of the sphenoid, as most observers report.

The prognosis and ultimate chances for recovery with good vision rests entirely upon two conditions. *First and most important*—upon the early diagnosis and proper interpretation of the eye findings. *Secondly*—upon the discovery and removal of all nasal pathology. Under No. 1—we would call your attention to the careful use of the perimeter in taking fields and the campimeter in taking blind spots. The use of the instruments is neglected, because of the time consumed in their careful, proper application.

Second—In all cases with enlargement of the blind spot a careful rhinologic and X-ray examination should be made, and in those cases where both are negative we earnestly suggest an exploration of the sinuses, paying particular attention to the posterior ethmoid, as the most probable site of disease.

## HETEROPHORIA FROM ETHMOID DISEASE

ALBERT H. ANDREWS, M. D.

CHICAGO, ILL.

The close proximity of some of the accessory cavities of the nose to the origin of the muscles controlling the direction of the eye movements should lead one to consider what might be the effect of disease in these cavities upon the ocular muscles. The recti muscles have their origin around the optic foramen, the origin of the internal rectus being at the inner side and closest to the ethmoid cells. Dissection of these parts shows the bone between the attachment of the muscle and the ethmoid cells and sometimes the sphenoid sinus to be no thicker than paper, and it is difficult to conceive of the mucous membrane on the nasal side of this partition being inflamed without the attachment of the muscle on the other side of the partition being affected. In other parts of the body, when the bone about the origin of a muscle becomes inflamed we find impairment of function, with a tendency for the parts controlled by the muscle to take a position which will cause the least strain. By analogy one would conclude that if the origin of the internal rectus should become inflamed the eye at rest would take a position somewhat converging, and that when the patient attempts to bring the two eyes parallel for distant vision there should be a disinclination on the part of the internal rectus to relax sufficiently to allow the external rectus to draw the eye into a position parallel with the eye of the opposite side. This should, and in actual experience does cause discomfort in using the eyes for distant objects, and tests for muscular imbalance show marked esophoria. When convergence for close vision is attempted, the work thrown upon the lame internal rectus causes pain, the eyes tire easily and the muscle tests for close vision show marked exophoria.

At ten inches distance from the eye a deviation of one inch to the nasal side, as seen through the Maddox rod, indicates an exophoria of practically six degrees. At twenty feet a deviation of one foot to the temporal side shows an esophoria of practically three degrees. While there is a slight tendency in the normal eye toward exophoria in making the close test, patients with ethmoid disease frequently show an exophoria of six to eight degrees. Esophoria in these patients as shown in distant tests varies from nothing up to ten or twelve degrees.

It is not always possible to say upon first examination in a given case that the heterophoria is of a nasal origin, but when a patient has asthenopia and the tests show esophoria for distance and exophoria for close, and nothing is done for the patient but to relieve conditions in his accessory sinuses and the asthenopia disappears and the muscular balance is restored, one can very properly suspect that the nasal disease bears a more or less direct causative relation to the eye symptoms.

One of the earlier cases coming under my observation was that of Dr. W., 46 years of age, who had suffered for many years from what he called eyestrain. He stated he averaged a change of glasses about every 6 months. He had experimented with prisms for constant wear and with prism exercises. Examination of his eyes showed esophoria for distance and exophoria for close. He was wearing full correction of his error. Examination of his nose showed a spur on the left side of the septum extending out between the middle and inferior turbinates and pressing on both. Polypi were protruding from under the middle turbinate. The spur was dissected out, the polypi were removed, and the ethmoid cells were drained. The discomfort disappeared, the muscular balance was much improved, and no further change of glasses for distance was required. Three or four years later the symptoms returned and he had a more extensive operation on his ethmoids and middle turbinate, the result of which I am to state. During the twelve years that I have been making these observations I have found many cases in which the apparent relation between nasal accessory sinus disease and asthenopia associated with muscular imbalance was even more marked.

The writer would not have anyone think for a moment that he considers all cases or even a majority of the muscular asthenopias to be of nasal origin. He would, however, call attention to the vast number of cases that pass from one oculist to another without finding relief from the most careful refractive correction. And he would further suggest that in many of these cases a thorough examination of the nose might show indications for a line of treatment that would bring relief to these sufferers.

#### DISCUSSION

DR. JOS. LICHTENBERG, Kansas City. In this report I want you to notice that all these cases were diagnosed from the eye findings, and later confirmed by the rhinologist in his examination. I want also to emphasize that some simple apparatus is all that is necessary, such as the campimeter of Peter, the tests of Wells and Bassett. Exploratory operation is justifiable, just as in other portions of the

body, as for instance, the abdomen. I would also emphasize the fact that the X-ray is not to be relied upon too much, as in the case of the young musician, where the findings were negative and the pathology found only by the exploratory operation.

One point was not mentioned in the paper, the possibility of the infection of the sphenoid sinus, especially, going to the other side so that it may affect the eye on the opposite side. The infection on the left side of the nose affects the right eye, for instance.

The literature on this subject is profuse, so we have tried to make a short, succinct paper, emphasizing these points.

DR. H. B. LEMERE, Omaha: I wish to emphasize the fact that many pathologic eye conditions are due to the latent antrum disease. It has been my custom the past three years to X-ray all cases of pus of the nose in which there were sufficient symptoms to warrant careful diagnosis. After X-raying these patients it has been my custom to study these X-rays myself in conjunction with the symptoms and the physical findings of the nose and throat. After three years I have been extremely surprised to find that in almost every case of pus in the nose there is a change from the normal in the shadow cast by the antrum. This is especially shown in the position known as the Waters' position, in which the sinus shadow is free from that of the petrous portion of the temporal bone. After coming to the conclusion that these nasal catarrhs were dependent on the antrum condition, I devised a technic to keep these sinuses free from pus. This technic I presented in a paper before this Society last year. This latent infection of the antrum I have found to cause conjunctivitis, iritis, choroiditis and optic neuritis more often than ethmoid infections. The thorough and through washing of the antrum usually brings about a return to normal of the eye condition so rapidly that there can be no doubt that it is dependent on the latent antrum condition.

DR. HAROLD HAYS, New York City: These cases that have been presented show very plainly the necessity for a cordial relationship between the ophthalmologist and the oto-laryngologist. I do not believe there is a more confusing class of cases presented to the nose and throat specialist. In my remarks I wish to eliminate all cases in which there is direct evidence of a lesion in the nose, in which the trouble is self-evident from the nasal examination or X-ray plate. There is a large number of cases which are puzzling to me because the examination is negative. You have your conference with the X-ray man—and I think there should be such a conference, and that a nose and throat man should not take his report without conferring with him—and after you find there is nothing to warrant you in operation, these cases show that even with negative findings operation can result in good. I have had a number of cases referred to me by Dr. May, of New York, which were very puzzling. One case of optic neuritis of long standing, a woman from Omaha, I believe, had been gone over several times and after making every possible test and seeing Dr. de Schweinitz, we were no further along than in the beginning. The tonsils were moderately diseased. We decided to remove them and, at the same time, do a lumbar puncture and examine the spinal fluid for lues. The test was negative. The eye condition im-

proved somewhat after the operation. I do not know that that proves anything. Cushing in a paper printed in the A. M. A. stated that too many nasal operations on the nose were being performed for eye conditions where there was no causative relationship. I also feel that we should err on the side of conservatism.

Three months ago another interesting case presented, a woman who had been a renowned etcher. The findings in the nose were negative. Much against my wishes, but because Dr. May desired it, I did complete a exenteration of the ethmoids. We had an improvement in eyesight but I cannot say whether this was permanent.

DR. JOS. BECK, Chicago: It is not only necessary to have a cordial cooperation with the ophthalmologists but the neurologists and all the other special branches as well, in order not to slip up in our diagnosis, because there are symptoms referable to other parts of the body. I think any man who has had considerable experience in these cases ought to be able to report some striking results. In my experience I have had three cases of marked loss of vision with permanent recovery, following sinus operations. Most of them had marked loss of vision, probably due to the fact that I operated too late when permanent nerve changes had already taken place.

The question was raised by Dr. Lichtenberg that the X-ray is sometimes a fallacy. Some men say it is negative when they do not consider the pathology of the sinus. In cases where the bone is rarified or swollen, especially in the vicinity of the optic foramen, it can produce changes of the optic nerve that will account for the symptoms.

Dr. Putnam, of Sioux Falls, brought a case down to me, a young woman that had rapidly lost her vision, so that she could barely recognize fingers within two or three weeks from the outset of her trouble. Dr. E. V. L. Brown made the eye examination and found the retina normal, Wassermann negative, nose negative, and negative X-ray as to sinuses. Yet Dr. Brown said, "You unload that nose and you will see and she will see." Consequently I performed an ethmoid exenteration and she has now returned to normal vision, and remains so.

DR. G. F. SUKER, Chicago: I wish to emphasize what Drs. Hays and Beck have said in very strong terms. I think we should employ conservatism in nasal surgery with eye complications. The less surgery done in a hyperplastic sinuitis the better the general results. I deprecate the idea of reckless intranasal surgery for eye findings unless thorough general systematic treatment is found of no avail. One thing that has not been mentioned, is that in the hyperplastic type you often have more or less increased bulbar conjunctival vascularization on the nasal or temporal side of the globe. This in association with the nasal findings will give you a clew as to whether or not the true seat of the disease may be ascribed to one of the sinuses rather than the intraocular findings themselves. These conditions manifest practically no pathology in the fundus except a haze, and visual field changes. Any fundus that appears hazy may be so from a neighboring focal infection. It is this reckless surgery that gives us

the untoward results. If the conservative line of treatment is used you will have better results.

This question is a relatively old one. Nothing therein is new save the confirmatory clinical evidence. In one case which the late Dr. Wm. L. Ballenger and myself had several years ago, there was complete bilateral blindness associated with bilateral choked disc and the exenteration of both sphenoids gave us practically normal vision. But six months later the visual results were just as discouraging as in the beginning due to the rapid secondary optic atrophy.

DR. J. A. STUCKY, Lexington, Ky.: Since I cannot discuss the treatment of these conditions, because the paper deals with symptoms only, I will simply say that if we are as careful with our preoperative as we are with our postoperative treatment we will get a great many of these cases relieved without surgical interference in the nose. In operations on younger people, under 20 years of age, it is the result of the operation not thirty days afterwards, but six months or a year after that we must consider. We are on the right track, but there is danger of being too radical in our intranasal surgery. We need to be conservatively radical, never forgetting that free ventilation as well as drainage is essential.

DR. W. H. WILDER, Chicago: I think this a very timely subject and excellently presented. It seems to me there can be no dispute as to eye conditions resulting from suppurative or non-suppurative processes in the sinuses adjacent to the orbit. That has been demonstrated by various observers and this paper is a good illustration of the conclusive reports that have been made on the subject.

One excellent point made by the essayist is the necessity of being reasonably sure that there is a distinct organic change going on in the eye, before concluding that operation on the sinuses is necessary. If the ophthalmoscope reveals a blurred optic disc, suggestive of beginning optic neuritis, associated with impaired vision, the indications will be quite clear. But if the ophthalmoscopic evidence is lacking, we may be forced to rely upon the evidence obtained by the measurement of the visual fields and the size of the blind spot of Mariotte.

Here the utmost care is necessary, for there is no examination we make in which there is greater chance for error, because of the subjective character of the tests. However, if the work is carefully done, we get results that are valuable, and that may justify our belief that changes are taking place in the optic nerve.

Having excluded other causes for the optic nerve condition that has been found, I do not think it is radicalism to suggest an operation on the neighboring sinuses, the ethmoid and sphenoid, even if the X-ray and transillumination have failed to give positive information. It would be radicalism in the extreme, to operate on such cases before excluding all other causes, unless there is positive evidence of disease in the ethmoid or sphenoid sinuses. Promptness in arriving at a conclusion is essential.

Recently a case illustrating this came to me. The wife of an eminent physician in Chicago suddenly began to lose sight in one eye. The ophthalmoscope showed no abnormality of the optic nerve

or fundus. The fields showed central relative scotoma and enlargement of the physiologic blind spot. The central vision fell within a few days to 10/200. Although we had no definite information from the X-ray, and having excluded other causes, at my suggestion, Dr. Frank Brawley operated on the ethmoid and sphenoid with the gratifying result that the fields returned to normal and the central vision to nearly normal.

DR. G. F. KEIPER, Lafayette, Indiana: I will never forget the advice that the late Dr. James L. Thompson, of Indianapolis, Ind., gave me when I began the practice of ophthalmology, and that is to examine the nose whenever I made an examination of the eyes. Every ophthalmologist should use a head mirror, a nasal speculum and a nasal probe. It is surprising what these will reveal in the way of reflexes when nothing else can be found in the nose to account for certain obscure eye symptoms. We seem to have forgotten that the nasal nerve runs largely through the orbit before it enters the nose and that the nasal nerve connects up with the ciliary ganglion which sends fibers to the eyeball. Hence pressure in the nose will manifest itself not with symptoms in the nose but reflexly in the eyes. Eye symptoms thus are relieved by relieving pressure within the nose.

DR. L. GUGGENHEIM, St. Louis: It seems to me that one of the most important and frequently embarrassing problems in connection with this subject is the question of the method of examination. We all know of ethmoid cases which are pronounced negative and which, when operated upon for exploratory purposes, disclose ethmoid disease. This situation not infrequently arises: A case is examined by myself and diagnosed hyperplastic ethmoiditis to a degree indicating operation. The patient is then sent to another oto-laryngologist and the findings are negative. The patient naturally takes the advice of the other man and is not operated upon. The method of examination is therefore one of the most important things in connection with the problem. Many oto-laryngologists examining the nose with an ordinary light conclude if they find no pus and no polypi that the sinuses are negative. These are often the cases that show results from exploratory operation. If the naso-pharyngoscope, nitrogen lamp and arc light were more frequently used, more cases of ethmoid and sphenoid disease would be found. I have found that careful probing of every accessible portion of the ethmoid and the sphenoid region will in the case of sinusitis often cause pain in the eye. I have a case now where any part of the nose can be touched without pain until the anterior portion of the anterior ethmoid region is probed. This causes intense pain in the eye of the same side.

A note of warning in connection with operations upon the ethmoid labyrinth: this procedure is frequently followed by loss of the sense of smell, in addition to the numerous other unpleasant and well known consequences.

DR. N. M. BLACK, Milwaukee: The subjects of the papers under discussion are eye symptoms and heterophorias from intranasal disease. The hyperphorias have not been mentioned, although they are as often to be found as exophoria and are peculiar in that they vary from day to day, apparently with the changes which take place in the sinus con-



dition. As a rule the hyperphoria disappears with clearing up of the acute sinus symptoms.

Dr. Lorie, in the histories of his cases, did not give the muscle balance in the near, which in my opinion gives more definite information as to the status of the intrinsic muscles, than the balance in the distance; especially so if considered in conjunction with another symptom not mentioned, i. e., the apparent loss of accommodation of the eye on the affected side. Distance vision may not be disturbed, but if the ability of the eyes to accommodate be tested, it will almost invariably be found that print cannot be seen clearly as close to the eye on the affected side.

DR. HARRY GRADLE, Chicago: The various symptoms mentioned have been brought out clearly but it would seem advisable to speak of the pathologic anatomy which is the underlying basis of those symptoms. The general anatomy of the optic nerve and its relations within the bony canal are so well known to you that but a brief reiteration is needed. The comparatively thin walls of bone separating the orbit from the accessory sinuses, the periosteum lining the orbit in free communication with the mucosa of the sinuses by the perforating vessels and lymph channels, the general flow of lymph and venous drainage of the periosteum toward the intracanalicular portion of the optic nerve where the orbital periosteum and dura of the optic nerve merge, the drainage of the combined membranes through the small veins perforating the optic nerve and ending in the vein of Kuhnt and Vossius, that central vein that runs through the posterior portion of the optic nerve and empties directly into the cavernous sinus, the peripheric location of the fibers within the optic nerve that come from the retina immediately around the optic disc (peripapillar fibers), the crescentic bundle of fibers immediately adjacent to the central vein that carries the papillo-macular bundle, the diffuse arrangement of the peripheric retinal fibers throughout the optic nerve.

An extension of a pathologic process from the sinuses must of necessity be along the venous or lymph channels and if the advance be not stopped by free anterior nasal drainage, will eventually involve the periosteum of the orbit, the dura-periosteum of the canal, and probably the optic nerve. Such involvement is probably in the nature of a perivascular or perilymphatic edema and as such causes pressure upon the nerve. The manifestation of such pressure depends upon the location of the pressure and may be enlargement of the blind spot (pressure upon the periphery of the optic nerve), central scotoma (pressure from the central vein upon the papillo-macular bundle), or ring scotoma or complete amaurosis (diffused pressure throughout the entire nerve).

DR. ALLEN GREENWOOD, Boston: It is a great pleasure to be in accord with such an acute observer as Dr. Gradle, and I want to endorse his statement in regard to pressure on the optic nerve being the cause of the nerve condition in many of these cases. I wish also to call your attention to the fact that in the future we must differentiate the types of these cases whether the symptoms are due to pressure on the optic nerve or whether there is a direct extension of inflammation, or whether there is an infection, the result of a toxic process,

that is, the carrying of toxins thru the blood stream to the nerve. I think the usual cause is pressure, but we must differentiate between the above types. Then we will get along faster than at the present time.

DR. LORIE (closing discussion): I wish to thank those who have discussed this paper. If you will recall the mention of the operations on the nose, you will remember these were called "exploratory" operations on the nasal sinus, when we could not find the pathology. It is easy to back out if nasal pathology is not found. You do no harm in exploring these sinuses for pathology if none is found. We purposely presented cases over a long period of time. The cases presented were all either two or three years back, and we have seen no indication that there has been progress backward in their blindness.

DR. ANDREWS (closing discussion): The character of this discussion has been exceedingly gratifying to me. Some of the older members remember when such a paper would not have been received very kindly. There have been oculists who would not believe there was any relation between diseases of the eye and the nose. I want to protest against reckless surgery in the nose. The nose that has had its middle turbinate and ethmoid cells removed is and will be a crippled nose as long as that person lives. The ethmoids can be explored without doing harm, and if necessary, they can be drained beneath the middle turbinate without permanent injury. There should be careful examination for muscular imbalance. I think the most of us are inclined to limit our examination to tests for the distant tests and we are not as careful in examining the muscles for close vision as we should be.

A PRELIMINARY REPORT OF TWO CASES OF SINUS  
THROMBOSIS WHICH, AFTER ALL THE REG-  
ULAR PROCEDURES HAD FAILED TO GIVE  
RELIEF, WERE APPARENTLY CURED BY  
A BLOOD TRANSFUSION

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The kernel of my paper, this morning, lies in its title—A preliminary report of two cases of sinus thrombosis which were apparently cured by a blood transfusion. Before citing these two cases I wish to state that I have had no further opportunity to study the condition, that I do not consider a study of two cases enough to warrant my making any claim in regard to them, and that I am reporting them simply for your consideration.

In both cases there was a confirmed diagnosis of acute mastoiditis with sinus thrombosis. The laboratory reports showed a positive streptococcus infection. A mastoidectomy with ligation of the jugular was performed in each instance. The temperatures ran from 99 degrees to 106.6 with no drop after operation. A blood transfusion was done; this was followed by the rapid recovery of both patients.

The first case was a boy of 3 years of age, who had developed an otitis in the right ear. It was incised and he made an apparently normal recovery. Two weeks later an earache developed in the left ear, which was also incised, but with no relief. For four or five days following he ran a slight temperature, but on the evening of the sixth day the temperature rose to 106.4, dropping the following morning, April 10th, to 99, when he was sent to the hospital.

On admission the temperature was 105.4 and the laboratory report showed a streptococcemia. A simple mastoidectomy was performed April 10th with no drop in the temperature. A secondary mastoidectomy was performed on April 11th and gave no relief. On April 15th there was a morning drop to 99, succeeded by a chill and an evening rise to 106.6.

On April 18th a blood transfusion was done. The following day the temperature rose to 105.2 in the evening, falling the next evening to 104 and from then on gradually dropping to normal with complete recovery.

The second case was a boy of 13 years. Feb. 14th he had pain behind the left ear for 3 days; both ears had been discharging for one week, the right profusely, the left slightly. The boy had tonsillitis and grippe two weeks previously, at which time he complained of earache and stuffiness in the left ear. A paracentesis was performed and pus found. The right ear discharged spontaneously the day before paracentesis was done on the left ear. The day before admission to Beth Israel Hospital temperature was 99 in the morning, rising to 105 in the evening. The night before admission patient had a severe chill. He was admitted to service of Dr. Felix Cohn February 21. Mastoidectomy was performed the same day. The following evening temperature was 104.2. On Feb. 23rd ligation of the jugular was performed and the sinus was exposed. The temperature on the evening of the 24th fell to 101.4, rising again the following evening to 106.2 and fluctuating between 104 and 106.2 each evening following until March 9th, when the evening temperature was 105.6. On the morning of the 10th the temperature dropped to 98 and the patient had a severe chill. A blood transfusion was done, followed by an evening temperature of 105.4, after which a gradual dropping each evening was noted, the evening temperature on March 20th registering 99.8 and remaining down with complete recovery.

The blood findings in the second case are of interest. On Feb. 21st, the day after admission, leucocytes count was 16,000, polynuclear 76, mononuclear 24. On March 23rd leucocytes 9,800, polys. 66 and mononuclear 34.

On Feb. 23rd a blood culture showed positive streptococcus hemolyticus, 10 colonies, 1 plate. An ear culture showed streptococcus.

On the 27th a blood grouping—Group IV.

On March 2nd a blood culture exposed to temperature of 42 deg. of C. was sterile.

On March 8th a blood culture showed streptococcus viridans, 5 colonies, 1 plate.

On March 15th a wound culture showed streptococcus aureus. A blood culture was sterile.

May I briefly refer to the literature on sinus thrombosis?

Investigators in the field of sinus thrombosis have demonstrated at least four ways in which it may be caused: 1, infective microorganisms (streptococcus hemolyticus and streptococcus mucosa being the most frequently demonstrated);

2, structural changes in the intima of the vessel or organ, probably due to the irritation caused by the toxins of the bacteria; 3, disturbances of the blood current resulting from loss of blood, weakening of the heart action; 4, chemically by the change produced in the blood platelets by the infection.

Eberth and Schimmel injured the vessel walls and produced thrombus.

Jakowski injected bacteria into the circulation. At the same time he produced (usually by ligation) a circulatory disturbance in some other part of the body. In nearly every instance a thrombus occurred.

Talke exposed vessels in 44 animals, placing pure cultures of staphylococci in contact with the vessel walls. In 33 cases thrombus occurred, in 11 cases there was no thrombus.

Stenger injured the wall of the sinus and applied an infected tampon (streptococci from an infected ear), producing an extensive thrombus in the lateral and superior petrosal sinuses. Stenger concludes in part:

The greatest protection against thrombosis is the vessel wall itself; that bacteria passing through a healthy vessel wall are destroyed in the circulation; that thrombus is caused by inflammatory changes in the blood which are indirectly caused by bacterial invasion, and that the thrombus occurs before the bacteria enter the circulation, the infection of the thrombus being secondary.

Bacteria can in almost every instance be demonstrated in the circulation. Libman and Celler studied 277 cases of otitic origin with particular reference to streptococci, streptococcus mucosa and the pneumococcus, finding streptococci alone or with other organisms in 81.46 per cent of cases, streptococcus mucosa 10.34 per cent, and pneumococcus 8.2 per cent. These investigators call attention to the fact that the earlier authors found the pneumococcus more frequently than the streptococcus, but that notwithstanding this and the fact that they also have found the organism, there have been hardly any cases of sinus thrombosis reported as being due to a pneumococcus infection.

Buerger and Ryttenberg have shown that the pneumococcus can be so changed in the blood that it is very difficult to differentiate it from the streptococcus. Libman and Celler citing this, also state that they have not been able to verify their sinus thrombosis studies. Positive results were found only in cases complicated by sinus thrombosis or meningitis

by these authors. They state: "Our studies show that cases in which streptococci are found in the blood after the disease of the mastoid is properly operated upon, and in which clinical symptoms persist and in which no other cause can be found for a streptococcemia, are cases of sinus thrombosis." Libman believes that in every case of sinus thrombosis there is a bacteriemia at some time.

Leutert concludes that every case of otitis having a bacteriemia is caused by sinus thrombosis.

Brieger believes that cases of otitic pyemia occurring without sinus thrombosis are the exception and not the rule.

The diagnosis of sinus thrombosis is not always easy. A blood culture is perhaps the most valuable aid. A negative blood culture does not exclude sinus thrombosis. The culture is taken either before the bacteriemia is established or the bacteria have been rapidly killed off; mechanical interference of the clot, etc., all may give a negative finding. A positive blood culture with suppurating middle ear disease usually indicates sinus thrombosis.

Meningitis may also give a positive result, but may be differentiated by an examination of the cerebro-spinal fluid.

Malaria, typhoid, pneumonia, erysipelas, septic endocarditis, grippe should be carefully excluded.

Regarding the frequency of sinus thrombosis, statistics show it to be the most frequent of the intracranial complications. Out of 116 deaths from intracranial complication, Hassler reports 48 due to sinus thrombosis. Körner in 115 autopsies done on patients who died from otitic infections of the meninges found sinus thrombosis in 41 cases. A report of the Manhattan Eye, Ear and Throat Hospital cites 23 cases of sinus thrombosis out of 60 cases of intracranial complications.

Körner from a study of 100 cases concludes that sinus thrombosis is most frequently found in patients between the ages of 20 and 30.

Thrombosis of the lateral sinus resulting from middle ear and mastoid disturbance is the subject matter of this paper.

Alfred Braun has summarized his valuable investigations into the cause of this particular condition as follows:

"1. The inner table of the mastoid over the sinus may be diseased and abscesses form between the sinus and the inner table. This results in an inflammation of the outer sinus wall,

which in turn leads to the formation of a thrombus within the sinus.

2. The inner table over the sinus may be diseased and cause an extension of the inflammatory process to the sinus wall without the intermediation of a perisinus abscess. The phlebitis results in a thrombus formation.

3. A thrombus may form in one of the smaller veins of the mastoid process and extend into the lateral sinus."

It has become customary to divide the symptoms of lateral sinus thrombosis into three stages.

According to Ballenger, who bases his division upon the pathologic changes described by MacEwen, we have first, the thrombus, partial or complete, disintegration not established, accompanied by slight fever, rigors, headache in the affected side, slight local tenderness and edema. A blood count shows leucocytosis with an increased polymorphonuclear count. Second, the thrombus partial or complete, disintegration and systemic absorption established. The temperature is higher and there is an increased leucocytosis and polymorphonuclear count. In the third stage we have the thrombus partial or complete with disintegration and excessive systemic absorption. Chills, marked fluctuations in temperature from subnormal to 106 degrees, increased headache and tenderness. A still greater leucocytosis and polymorphonuclear blood count are present.

According to Brieger, varying metastatic lesions occur in 42 per cent of cases, the most common being in the lungs.

The treatment of sinus thrombosis has been entirely surgical, the simple mastoid operation, exposure of the sinus, removal of the thrombus, ligation or excision of the external jugular, packing of the lateral sinus.

Statistics show that cases operated in the first stage almost invariably recover, cases operated during the second stage show 50 per cent of recoveries, while cases operated during the last stage rarely recover.

In conclusion, I wish to make 7 brief points:

1. Infective microorganisms, changes in the blood walls due to irritation from these microorganisms, slowing of the blood stream, and chemical changes produced in the blood platelets are causative factors in sinus thrombosis.

2. In nearly all cases the bacteria can be demonstrated in the circulation, the streptococci and streptococcus mucosa being most frequently found. Investigators have shown that

a streptococcus infection points almost conclusively to a sinus thrombosis. The leucocytosis and polymorphonuclear count is greater than in simple mastoiditis.

3. Unless operated in the first stage, at which time a diagnosis is difficult and seldom made, the prognosis is bad, only 50 per cent of the cases recovering in the second stage, and nearly all cases terminating fatally in the third.

4. In the two cases reported the disease had reached the third stage and a fatal result seemed inevitable. Operative measures had failed to give relief. Relief was effected almost immediately by a blood transfusion.

5. Although I have had no further opportunity of demonstrating this method, the thought remains that much suffering might have been spared to the patients and their friends and much anxiety to myself had the procedure been adopted during the earlier stages.

6. Might it not be well to adopt it as routine in all cases of sinus thrombosis, basing the diagnosis upon the pathologic changes in the blood, established by reliable and frequent blood counts?

7. An early blood picture in all cases of otitic origin is important. A streptococcus infection usually indicates a sinus thrombosis. The condition is not favorable to early diagnosis, clinically. Operative procedures to be successful depend upon an early diagnosis. A blood transfusion may be justified by an early blood count. In my two cases, at least, it apparently effected an almost immediate cessation of symptoms and early recovery. Is it not worth further investigation?



# BRAIN ABSCESS OF OTITIC ORIGIN. A REVIEW OF 73 CASES DIAGNOSED AS BRAIN ABSCESS

G. W. BOOT, M. D., F. A. C. S.

CHICAGO

The material on which this paper is based consists of 68 case records from Cook County Hospital, all the cases occurring in the last ten years, together with five private cases.

These are classified as follows:

	Operated	Recoveries	Deaths	Total
Extradural abscesses .....	3	2	1	3
Undetermined brain lesion.....	0	0	1	1
Brain abscess, cause undetermined.....	0	0	5	5
Gumma of the cerebellum.....	0	0	1	1
Traumatic cerebral abscess.....	1	0	4	4
Otitic cerebellar abscess.....	4	1	4	5
Cerebral abscess secondary to nasal sinuitis	2	0	4	4
Otitic brain abscess.....	15	4	22	26
Brain abscess secondary to lung disease....	0	0	8	8
Brain abscess secondary to endocarditis....	0	0	1	1
Thrombosis of sup. long. sinus.....	0	0	1	1
Cerebellar tumor .....	0	0	1	1
Hemiplegia .....	0	0	1	1
Sigmoid sinus thrombosis.....	2	0	2	2
Cerebrospinal meningitis .....	0	0	2	2
Mastoiditis .....	1	0	1	1
Brain abscess secondary to pyorrhea.....	0	0	1	1
Probable cavernous sinus thrombosis.....	0	0	2	2
Traumatic cerebral hemorrhage.....	0	0	1	1
Meningitis secondary to erysipelas.....	0	0	1	1
Cerebral syphilis .....	0	*1	1	2
Total cases .....				73
Operated .....				28
Recoveries .....				7

\*Transferred.

Of the above I have operated on one case of extradural abscess with one recovery; four cases of cerebellar abscess with one recovery; one case of abscess of the frontal lobe secondary to frontal sinuitis with no recovery; and eight cases of abscess of the temporo-sphenoidal lobe with four recoveries. The cerebellar cases and the frontal lobe case that died were all complicated by extensive meningitis at the time of operation.

	Cerebral Abscess										Extra Dural Abscess																				
	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	
Dizziness	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Spon. Nystagmus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Headache	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Nausea	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Vomiting	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Facial paresis	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Ankle clonus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Increased K. J.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Aphasia	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Disturbed speech	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Disturbed gait	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Slow pulse	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Converg. Strabismus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Diverg. Strabismus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Diplopia	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Engorged retinal veins	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Choked disc	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Pupils unequal	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Conjunctival injection	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Exophthalmus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Rigid neck	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Clouded mentality	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Aphasia	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Incoordination	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Spasm of opp. arm	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Weakness of legs	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Pains in back	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Irrational	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Stupor	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Restlessness	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Involuntaries	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Rheumatism	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Conjugate deviation to opp. side	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Pain in eyes	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Wernicke Hemianopic reflex	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+</									

Otitic Cerebral Abscess		Cerebellar Abscess		Purulent Abscess		Purulent Abscess	
15	15	15	15	15	15	15	15
39	39	39	39	39	39	39	39
42	42	42	42	42	42	42	42
63	63	63	63	63	63	63	63
67	67	67	67	67	67	67	67
70	70	70	70	70	70	70	70
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
9	9	9	9	9	9	9	9
11	11	11	11	11	11	11	11
12	12	12	12	12	12	12	12
17	17	17	17	17	17	17	17
19	19	19	19	19	19	19	19
22	22	22	22	22	22	22	22
25	25	25	25	25	25	25	25
28	28	28	28	28	28	28	28
34	34	34	34	34	34	34	34
35	35	35	35	35	35	35	35
41	41	41	41	41	41	41	41
43	43	43	43	43	43	43	43
44	44	44	44	44	44	44	44
47	47	47	47	47	47	47	47
53	53	53	53	53	53	53	53
60	60	60	60	60	60	60	60
65	65	65	65	65	65	65	65
69	69	69	69	69	69	69	69
71	71	71	71	71	71	71	71
72	72	72	72	72	72	72	72
Leucocytosis		Leucocytosis		Leucocytosis		Leucocytosis	
Cell count of c. s. fluid		Cell count of c. s. fluid		Cell count of c. s. fluid		Cell count of c. s. fluid	
Kernig		Kernig		Kernig		Kernig	
Babinski		Babinski		Babinski		Babinski	
Brudzinski		Brudzinski		Brudzinski		Brudzinski	
Oppenheim		Oppenheim		Oppenheim		Oppenheim	
Gordon		Gordon		Gordon		Gordon	
Turbid c. s. fluid		Turbid c. s. fluid		Turbid c. s. fluid		Turbid c. s. fluid	
Nonne		Nonne		Nonne		Nonne	
Noguchi		Noguchi		Noguchi		Noguchi	
Ross Jones		Ross Jones		Ross Jones		Ross Jones	
Bacteria in smears		Bacteria in smears		Bacteria in smears		Bacteria in smears	
Tension c. s. fluid		Tension c. s. fluid		Tension c. s. fluid		Tension c. s. fluid	
Greenish c. s. fluid		Greenish c. s. fluid		Greenish c. s. fluid		Greenish c. s. fluid	
Deafness		Deafness		Deafness		Deafness	
Herpes		Herpes		Herpes		Herpes	
Caloric test		Caloric test		Caloric test		Caloric test	
Tache cerebrale		Tache cerebrale		Tache cerebrale		Tache cerebrale	
Vision		Vision		Vision		Vision	
Convulsions		Convulsions		Convulsions		Convulsions	
Petechial hemorrhage		Petechial hemorrhage		Petechial hemorrhage		Petechial hemorrhage	
Tetany		Tetany		Tetany		Tetany	
Word deafness		Word deafness		Word deafness		Word deafness	

Considering the symptoms noted in these cases of brain abscess, we find certain symptoms due to the general infection, such as fever, headache and leucocytosis, and others due to the location of the abscess.

*Fever* is not high unless there is a meningeal or other complication. Brain abscess alone is not characterized by high fever. Often the temperature is low, in the neighborhood of 99 or 100, and it is apt to be subnormal for a part or for most of the time. Ordinarily there is no more fever than can be accounted for by the suppuration of the middle ear or mastoid that precedes and accompanies the brain abscess.

*Headache* is due to at least three causes. It is partly due to the general toxemia of the infection, partly to the increase in intracranial pressure and partly to the localized meningeal involvement that precedes or accompanies the abscess. It is one of the commonest symptoms of brain abscess and it is likely that no case was without this symptom, though it was not noted in several of them, probably because they were stuporous or comatose when admitted.

*Restlessness* is another symptom that is rarely absent from a case of brain abscess. It is largely due to the headache. The suffering from the headache is so great that the patient is restless, moaning and tossing in his distress.

*Stupor* is a late symptom, the result of long continued increase of intracranial pressure. It is absent in the earlier stages of the disease or else the patient is only mentally sluggish.

*Nausea and Vomiting* are common symptoms associated with increased tension and with meningeal involvement. When they are pronounced I would suspect that there was considerable involvement of the basal meninges.

*Increase of the deep reflexes* such as increased knee jerks and ankle clonus are common. In a few of the cases they were diminished.

*Spontaneous nystagmus* was noticed in two of the four cerebellar abscesses and in four of the twenty-six cerebral abscesses. It would probably have been found oftener if looked for.

*Facial paresis* may have as its cause involvement of the facial nerve in the Fallopian canal, the direct result of extension of the otitis media. Facial paresis due to cortical involvement could hardly occur before the abscess reached great size and destroyed the motor centers or their conducting pathways.

*Aphasia* is one of the most characteristic symptoms in a left sided temporo-sphenoidal abscess, and its occurrence during the

course of a middle ear suppuration or following a middle ear suppuration should cause the gravest suspicion of a left sided temporo-sphenoidal abscess. Aphasia in the course of a left sided temporo-sphenoidal abscess is peculiar in that it is apt to be the result of a lesion in the center for the memory of words or of the pathway between this center and the motor center in the insula. Patients with this type of aphasia know what they have in mind but are unable to think of the word needed to express their ideas; for instance, one patient with a large left sided temporo-sphenoidal abscess wished a baked apple for breakfast. He said to his mother "I want, you know, one of those round things with juice over it." Another patient when shown a key and asked to name it, said, "Glass, no, not glass," but could not name it. When asked how he used it he went through the motions of turning a key in a lock. Another patient when asked the name of a knife could not name it but when asked what he did with it went through the motions of shaving. Still another patient when asked the names of his two boys could not remember them but said "they are funny names." It turned out that they were named Willard and Willis, rather unusual names for the children of an Italian, which this patient was.

The slow, hesitating and disturbed speech which these patients often show when not distinctly aphasic, is probably an earlier stage of aphasia, or the result of a limited lesion, or of one not quite in the right location to cause a typical aphasia.

*The disturbed gait* goes with disturbance of the balancing mechanism and with weakness of the lower extremities.

*Weakness of the lower extremities* is complained of by some of these patients, and when complained of in a case that may possibly be brain abscess, is significant.

*Slow pulse* is one of the most valuable symptoms of brain abscess, indicating as it does increase of the intracranial tension. The pulse may be absolutely slow, reaching a rate of 60 frequently, 50 less frequently and occasionally lower. Or it may be relatively slow as in a patient with a pulse of 72 and a temperature of 101. In either case it is of great importance. If in the course of a brain abscess which has been drained, the pulse goes down to 60 or lower, be suspicious at once that the abscess is not draining well and see that freer vent is given for the escape of pus.

*Eye Symptoms.* Among the eye symptoms are convergent strabismus, divergent strabismus, conjugate deviation of the eyes, conjunctival injection, exophthalmus, enlarged tortuous veins in

the fundus, choked disc and pain in the eyes. Inequality of the pupils was not present early nor was lack of reaction to light and accommodation. These symptoms occurred late in the disease.

*Choked disc and engorged tortuous retinal veins* are among our most precious diagnostic symptoms. They are not always present but in the great majority of cases, some change indicating increase in intracranial pressure will be noted in the fundus if looked for and if a good view of the fundus can be obtained. It may be that only engorged veins will be found but many times there will be seen to be some edema of the disc and this often becomes a complete choked disc. I have not seen retinal hemorrhages from brain abscess.

*Conjunctival injection of the eye on the side of the abscess* was noted in two cases of temporo-sphenoidal abscess and in one case of extradural abscess. Exophthalmos was noted once in temporo-sphenoidal abscess and once in extradural abscess. When these symptoms are present they are quite significant. They are not often present.

*Pain in the eye of the same side* was noted in two cases and is a symptom of considerable significance.

*The hemianopic pupillary reflex* was well marked in one patient with left sided temporo-sphenoidal abscess. She was stuporous and almost unconscious, but her pupils reacted when the light was thrown onto the right half of the retina and did not react when the light was thrown onto the left half of the retina. This reflex would probably have been found oftener had it been systematically looked for.

*Rigid neck, pain in the back and the sensation of weakness in the lower extremities, together with increase of the deep reflexes* are largely due to meningeal disturbances. They are common as symptoms of brain abscess, but disappear after drainage of the abscess provided that a generalized meningitis has not taken place.

*Babinski, Brudzinski, Oppenheim and Gordon reflexes* are often present and of value.

*Spasm of the opposite arm* occurs provided that the cerebral inflammation reaches far enough to involve the motor area. It is of value as indicating the extent of the lesion.

*Involuntary evacuations of the bladder and bowels* are seen late in the course of the disease when the mentality has become much depressed.

*Leucocytosis* is the rule. Inasmuch as these cases are accompanied by a suppurative process in the middle ear or mastoid, it can hardly be considered a symptom of much value in the diag-

nosis though its absence would almost necessarily rule out brain abscess.

*The cell count of the spinal fluid* is increased as a rule. It is probably always increased some time during the disease. It was within the range of what is considered normal in four of the cases of this series, being ten or fewer cells to the cu. mm. It was increased to as high as 16,300 in one case that recovered and to 6,250 in another who also recovered. As a rule the higher cell counts meant accompanying meningitis.

*Increase of tension in the cerebro-spinal fluid* was noted in most of the cases. This naturally goes with increased intracranial tension. These two conditions do not necessarily mean a diffuse suppurative meningitis.

*Turbidity of the spinal fluid* has the same significance as increase of cells. When the increase of cells is marked enough to produce changes that may be seen with the eye alone it causes turbidity. The greater the increase of cells the greater the turbidity.

*Increase of globulin in the spinal fluid* indicates an inflammatory condition and the tests for globulin were commonly positive.

*Greenish color to the cerebro-spinal fluid* was seen once. In this case I had the opportunity of watching the patient almost from the start of the acute suppurative otitis media. The patient, a girl of 14, came to Cook County Hospital complaining of ear-ache. The resident in the ear, nose and throat ward did a paracentesis. A few days later she entered the hospital with an acute mastoiditis upon which I operated. Still later she developed symptoms of brain abscess on the right side. Again I operated. When the brain searcher which I used had been thrust one centimeter upwards into the right temporo-sphenoidal lobe and the blades separated there was a gush of greenish cerebro-spinal fluid that spurted out at least 20 cm. The greatly distended lateral ventricle had ruptured through the weakened cortex although there was a centimeter of thickness between the ventricle and the searcher. Some of this fluid was caught and smears made showing large numbers of a short chained streptococcus. After this accident I found the temporo-sphenoidal abscess a little farther backwards, and drained it. The patient did very well for about two weeks when she became sleepy. The sleep gradually deepened into coma and she died apparently of encephalitis. She had no return of the symptoms of brain abscess. Unfortunately no postmortem examination was permitted.

*Tetany.* One patient who recovered had a typical attack of

tetany during the examination. His hands were drawn into the accoucheur's position and his feet were extended.

*Petechial hemorrhages* were noted in one case.

*Herpes* was noted in one case of extradural abscess and in one case of cerebellar abscess. It seems to mean involvement of the Gasserian ganglion of the same side as the inflammatory process.

*Reasons for errors in diagnosis.* The chief reason for errors in diagnosis is incomplete observation. If we will remember the symptoms I have named, and that they may occur in any case of suppuration of the ear, and that when such symptoms occur they should be run down to their right cause, we will avoid many errors in diagnosis. If a careful record is made of the pulse, and whenever it is either absolutely or relatively slow, further examination is made for possible increased intracranial pressure; if a systematic examination is made of the eye grounds of patient whose middle ear suppurations are not running as they should; and if lumbar puncture is done as early as it should be done, not many of these cases will escape proper diagnosis. Aphasia should always call for a careful examination to determine the nature of the lesion in the left temporo-sphenoidal lobe that is causing it. The nature of the lesions causing spontaneous nystagmus or pastpointing should be determined if possible. Finally how can we differentiate between meningitis and brain abscess? This is a difficult procedure for brain abscesses are usually accompanied by a local meningitis, the extent of which cannot be told without opening the skull. It is difficult to say when a case is beyond operative relief. I have seen a brain abscess recover after evacuating three ounces of pus. I have seen a case recover that had 16,300 cells per cu. mm. I have had a case recover that was comatose. Under such circumstances one is never justified in declining to operate while the patient is alive.

*Why is the mortality of brain abscesses so high?* 1. Because the diagnosis is not made soon enough; 2, because of mistaken diagnosis, calling the condition meningitis and considering meningitis of otitic origin not amenable to surgical treatment as happened recently with one of my cases. One of my patients had been passed on by an eminent authority on otology who advised against operation, saying that he did not think operation justified in such cases and Dr. X. did not either. Fortunately for my patient, I operated and the patient recovered, and is now working daily at his trade; 3, because of the dictum which has lately



emanated from a famous clinic that "Surgical treatment is of little value in the initiatory or terminal stages, or in the presence of meningitis." This clinic approves of operations only on old encapsulated abscesses. This attitude is the same as if an abdominal surgeon would refuse to operate on appendicitis until a well walled off pericecal abscess had been formed. Only one of my four recoveries from temporo-sphenoidal abscess had anything like an encapsulated abscess. 4. Another reason for high mortality is lack of sufficient boldness in draining such abscesses. Do not expect to locate brain abscesses often if you hunt for pus with an aspirating needle. Either use a proper two-bladed explorer after the type devised by Dr. Gifford, a knife, or a pointed hemostat. It is surprising the amount of exploring that can be done without damage to the brain function. On the other hand, do not maul the brain. Do not wipe out the abscess with gauze or pack it with gauze. It is not necessary to try to wall off the dura and pia by means of a coffer dam, in order to prevent meningitis. If the incision into the brain substance is made in the proper position the meninges will already be matted together so that cerebro-spinal fluid will not escape. This direction is the direction that the infection followed in getting into the brain. While I have never seen the stalk that is referred to by authors as existing in these cases connecting the brain abscess with the middle ear, yet in the sense that I have indicated it does undoubtedly exist.

*Why such work should be done by the Otologist.* First, because brain abscess is always the result of some preceding infection and such infection is most often in either the ear or the sinuses of the nose.

Second, because so much of our work is in such intimate relationship with the brain, we are in better position to notice and understand the symptomatology than the general surgeon is.

Third, we have the better technic because of our work with the mastoid and with sinus thromboses. We see the inside of the skull oftener than the general surgeon, and our methods are more refined.

*Plca for early operation.* Don't wait for your patient to become moribund before operating. Don't wait for the abscess to become encapsulated. To do so may improve your percentage of recoveries in operated cases but it will not improve your mortality rate in brain abscesses. Don't refuse operation to any poor mortal because he has a high cell count in his cerebro-spinal fluid or because his neck is rigid, or because he is unconscious.

He may recover if his abscess is properly drained. Exploratory operations in such cases is just as justifiable as it is in abdominal operations and quite as apt to be innocuous for the patient. You could hardly make the mortality rate of brain abscess higher by operating than it is without operation. And if you save even one patient who would otherwise die your operation is justified. You ought to be able to save 50% of your otitic cerebral abscesses. Don't wait for a patient with brain abscess to get into better condition for operation. Operate as soon as the diagnosis is made. Don't say as one prominent general surgeon did, "If she is alive tomorrow I will operate. If she is not alive she would have died anyway," for you may find as he did that she was dead when tomorrow came and the postmortem showed an abscess that could easily have been drained. Do not wait nine days after diagnosis as another general surgeon did because "the patient was never in condition to operate" and finally died without operation. Such actions only promote Christian Science and other unintelligent cults.

#### DISCUSSION

DR. JOS. C. BECK, Chicago.: If one has had the pleasure of watching Dr. Boot work on these cases as I have at the Cook County Hospital, he will appreciate better what it means to give a report like this in the manner in which he has given it. I cannot add much to the splendid results he has given. Recoveries, altho small in number, he has made a great step forward. He did not follow the dictum of the men who have said "Do not operate on septic meningitis patients." He has operated on them with satisfactory results, in that he has saved the life of the patient. I would be glad if the essayist would rewrite this paper and divide the subject into two classes of cases, or rather, cases with late and early symptoms. We are after the early symptoms. Let us have the early symptoms and let us get them clearly fixed in our minds, for that is when we want to operate. Any one can recognize the late symptoms, and that does no good except to say that there will be a fatal termination.

The point Dr. Boot makes, I believe is a good one. Operate on all cases where you make the diagnosis of brain abscess, for there is nothing to be gained by not operating.

(Dr. Beck exhibited sections of multiple tumor of the brain which was a primary carcinoma).

DR. L. GUGGENHEIM, St. Louis: I wish to mention the excellent work of Le Maitre of France. The cause of death following operations upon the brain is very frequently meningitis. Le Maitre claims that these cases develop meningitis because of free incision and the resulting extension of infection. He has operated with far better results than most of us by employing the puncture method with daily increase in the size of the needle until he finally gets walling off the meninges.

I would like to report briefly the following case: The patient was seen about two months after an attack of pneumonia. During the attack there was discharge from the right ear and mastoid tenderness. This cleared up in a short while. When I first saw the patient he was having convulsions, severe headaches, speech disturbances, etc., etc. Operation disclosed a temporo-sphenoidal lobe abscess on the right side. The patient improved rapidly and was soon able to sit up in bed. His convulsions and headache disappeared and his speech improved. Shortly after he developed a paralysis of the right arm and leg with motor aphasia. We decided he must have something on the opposite side. Operation disclosed a temporo-sphenoidal abscess on the left side. He lived but a short time after this operation. Autopsy disclosed an enormous subdural collection of pus over the vertex.

DR. H. O. McDIARMID, Brandon, Canada: I want to give a verbal report of a case, unique in my experience, that happened four or five years ago. The patient was referred to me for eye diagnosis, and I had no doubt it was brain tumor or brain abscess, but could not arrive at any conclusion as to location. The patient was very ill at times and at times better. I sent him immediately to Dr. Cushing. He refused to operate, thinking it useless, and told her husband to take her home immediately. They got to Ontario and she grew so ill that the husband went so far as to make funeral arrangements. She then made a recovery and made the trip home in fine shape and I had a letter from her about every six months and she is now in better health than ever and does a certain amount of work about the house, but is absolutely blind. It was the first case I had any doubt about as to abscess or tumor, but my final conclusion was possibly a cyst in the lateral ventricle.

DR. BOOR (closing discussion): I realize that the paper is not in proper shape, but it is almost impossible to classify these cases with regard to early and late symptoms. The earliest symptom is probably headache, following suppuration. When the pulse becomes slow, get busy as soon as you can, or if he develops aphasia get busy, no difference what the stage of the abscess; the same with hemianopsia. I do not believe it is ever too late to operate unless the man is dead. You cannot tell until you get in there how far along the abscess is.

I did not report the abscesses due to sinus lesions.

In the case where the cerebro-spinal fluid spurted out, I do not believe the patient had a second abscess, for the reason there was never any evidence of increased intracranial pressure. She gradually became sleepy and did not wake up. I think it was a case of encephalitis.

With regard to walling off by repeated punctures with a needle, it seems to me hardly justifiable for the ordinary person to go about doing this. Even if the meninges were not walled off they would soon become so; besides, there is a constant tendency to carry infection out, not in. It seems to me that in starting out with a little needle and later a larger and a larger needle, you are wasting time. The sooner you get at the operation, the better for the patient.

With regard to the case of brain abscess secondary to pneumonia, in the cases I have had occasion to look over it was a rule that

brain abscess secondary to empyema was multiple, but this is not true of brain abscess secondary to middle ear disease.

You should make a good incision, but do not traumatize the brain. Again, with regard to the walling off of the abscess, it is wholly analagous to waiting for the walling off of an abscess of the appendix. Those that are not walled off are the ones you will save if you operate early in the proper way.

## THE BEST PAPERS FOR A SCIENTIFIC MEETING

EDWARD JACKSON, M.D.

DENVER, COLO.

This gathering consists of 200 who have come to hear the paper, and one to read it. Of the hearers, taking the average for the last year, 4 or 5 will discuss it. During this meeting, each reader or discussor of a paper will be a hearer 10 or 20 times as often as he is a speaker. All reasoning based on the principles of democracy and the obligations of fellowship demands, that the interests of the hearers shall determine the use that every reader or speaker makes of his time. Even if the speaker is a "superman" and the bulk of hearers are just ordinary mortals, the one "superman" is speaking to the 20 or 30 "supermen," who also have their places on the program, and the overwhelming preponderance of interest is still with the hearers.

The tastes, needs, physical endurance, and psychologic processes of the hearers ought to be the determining influence in the selection of a subject, the aspects of it set forth, the choosing of words to express the ideas, and the length of time occupied by every paper brought before this or any other medical meeting. In so far as each writer is conscious of these conditions, and conscientious and skillful in meeting them, will his paper, and the session be a success. The fitness of the program committee for its work is measured by its ability to get writers who meet these requirements; and by arranging for sufficient time to devote to discussions, without letting the total program overstep the bounds set by the physical and mental limitations of our common humanity. It is under such rigid limitations that a paper should be written and a program arranged.

A meeting like this is possible because speaker and hearer have a common language, common knowledge, common interests. We have studied medicine and especially ophthalmology and oto-laryngology, and our common acquaintance with their facts, their literature, is the starting point for every reader's argument, the foundation on which every paper is to be built. The reader who takes up our time rehearsing what is already common knowledge, reading extracts from our com-

men literature, whether in quotation marks or not, whether citing particular authors and books or not, the man who reads a "textbook paper" is wasting our time and his own. Justice, mercy and the good of mankind demand that he should cut it out, or be eliminated from the list of possible readers of papers.

Less common and less harmful is the laboratory worker, or the specialist outside the lines of our ordinary work or reading, who undertakes to give out ideas that the mass of his hearers are not prepared to grasp and master. Perhaps the most common sinner in this respect is the worker in pathology, who assumes that we know the significance of the terms he uses when we do not. It may be that we ought to know their meaning; it may be because the great mass of us have never had that training in pathology we should have had, or we are not keeping up our reading in collateral medical science as we should.

But the fact remains that we are out of place listening to a paper we do not understand, and the reader is out of place reading it to us. It is a good thing to have our curiosity awakened, and to be impressed with the fact that there are things we ought to know. But too much of such "high brow stuff" bears in the fact upon our consciousness that we are getting nothing out of it; and we naturally and impolitely go to talking with a neighbor or slip out of the room or go to sleep. In this way we get a distaste for real learning for which we ought to cultivate our appetites.

The rule of reason applied to a paper read before a society meeting is, that from the one hearing the auditors will be likely to grasp an interesting and important idea that is new to them. If the idea is one that can be grasped only by the mastery of statistical tables, or repeated readings, or by weighing prolonged involved arguments, the presentation of it by a paper in a full program does injustice to the idea set forth, injustice to the writer, and what is a hundred times more important, injustice to the audience, that has given its time and effort to do something that under the circumstances can not be done. The idea may be important, valuable, interesting, if only we could grasp it. But if it cannot be put over in that way, don't try it.

Statistical tables or long series of case reports that get significance only by comparing one item with another should never be read in a meeting. They may contain the concen-

trated essence of wisdom, but no one will ever get it out or recognize it from listening to them. Even the presenting of tables and graphs by means of charts or with the lantern is unwise, unless the picture can remain long enough for the audience to work out and master its details, either from the lettering on it or from the deliberate detailed explanation of the reader. To read a paper, and then rush through a series of pictures just to show that you have them, is an affront to those who are giving you the courtesy of a hearing.

The old ballad has it "much that well may be thought cannot wisely be said." Much that well may be written and read, cannot profitably be listened to. Much that can be looked at and studied with interest and improvement at leisure, when we can go back and reread, or stop and think out the suggested line of argument, or grasp the implications of the statement, is mere nonsense to listen to or glance at.

It is not meant that pictures should not be used in connection with papers read before medical meetings. They should be used more than they are now; but not as an addendum crowded in after the full time has been given to the paper, to be submitted to by the audience in the hope that the picture will explain what the paper did not. But like the text they should be strictly devoted to bringing out the point that justifies the existence of the paper. They should be few, simple, subordinated to their purpose; and each given time enough with the accompanying explanation to make clear the point they are intended to illustrate. Simple diagrams especially such as can be drawn on a blackboard before the audience, and explained as each line is added, are the most effective. If lantern slides, or charts previously prepared are used, the explanation may well follow the process of construction, giving the meaning of each line or figure one by one. If it seems hardly worth while to arrange for a lantern exhibit of one diagram, remember it is still less worth while to exhibit a half dozen that can only be glanced at and not explained.

Over every paper read before a medical society is the iron limit of time; enforced by the full program, the need of time for discussion, the number of readers or speakers crowding each other for a hearing, the limit of time that busy practitioners can spend at these meetings, and the limits of human capacity to give close attention so as to assimilate new ideas. We all feel this limitation when we sit in such a meeting try-

ing to reap the full benefit of the opportunity; but it needs to be emphasized and enforced upon every writer when he is preparing his paper.

Limit your subject to one that can be adequately presented in the time rightly at your disposal. Usually limit it to the presentation of a single idea that you can "put across." Illustrate this, enforce it in every way you can, but all the time stick to your point as a wrestler would stick to his well matched opponent. This need for time to be put to its best use, is the reason for cutting out all "padding"; all display of cases that do not enforce the main point; all unnecessary details of negative or unrelated findings, that some suppose give an air of scientific thoroughness to what they have to report; all extracts from authorities by which you attempt to show that you are well read; all unfruitful speculations to indicate how much thought you have given to the subject.

Your point will penetrate farther without the padding; as you can stab deeper with a stiletto than a walking stick; the multitude of cases camouflage the one that would illustrate. Observe your cases, record your details, read most widely, lie awake at night and speculate indefinitely upon the significance of your idea; and then *bring us your results*, not your methods of arriving at them. It is a common fault of laboratory papers that they give too much detail of method. Such detail is bad enough when you have to wade through pages of it in a printed report. It is intolerable in a paper read before a meeting.

But the fault is not confined to laboratory papers. It appears in clinical papers also, in the details regarding every ocular appearance and general condition of the patient, whether it has any bearing on the disease for which the case is reported or not. Let your readers assume that you would have observed all these things if they had been present and had any bearing on your subject. This unrestrained desire to tell all you know, to prove that you know it makes you a bore in the medical society, just as it does at the dinner table or in the social club. Overcome it, if you wish to be welcome on the program of the medical society.

What subjects are likely to prove of interest in such a meeting as this? First unusual clinical cases. These stripped of all padding can be well presented in a few minutes. Carefully observed they furnish matter of interest to all who are likely to encounter them in practice. Supplemented by care-



ful reading, not necessarily to quote but to get the general view point of the profession, their really important features can be emphasized so as to make the consideration of them of real benefit to the hearers. Along certain lines, as ocular injuries, we never see two cases exactly alike; and the experience of any one practitioner should be supplemented by that of the whole profession. But every case history should go on to include the final result, if you have to wait years for it. The history of the case that is reported to get somebody else to make a diagnosis, or before a full study has been made of it, is generally a nuisance in the literature. Case reports are easy to make if one keeps fair histories of his cases. They are common in the literature, but of good ones there is no excess.

Less common and more needed are good papers on common diseases. The dangers are that they will not bring anything new to their hearers, and that they will try to cover too much of the subject in one paper. Papers and discussions on cataract too often exhibit these faults. There is a great deal of interest about cataract, there is a great deal to be learned about it. But there is also a great opportunity for text book repetition, and wandering discussion regarding it. The paper that will be listened to and remembered regarding it will confine itself to one small definite phase of the general subject; and will give experience or ideas regarding it not to be found in the textbooks.

Special therapeutic and diagnostic procedures are always of interest, if presented clearly without undue elaboration, and without any effort to occupy more time than is absolutely necessary. A point in therapeutics, definitely presented, will always get attention. Somebody has a case in mind for which he welcomes the suggestion. All are interested. With diagnostic procedures, there may be more need to emphasize and illustrate and explain. An advantage of the paper read to a meeting, over the paper printed, is the opportunity to answer questions, and supplement what has been written, or to illustrate it by actual application. In so far as this may require additional time, economic use of time must be the more rigidly kept in view, in preparing the paper.

Truly original investigations do not generally furnish the best subjects for these papers. When common professional experience and knowledge is departed from, too much detail

and explanation are required to make the new subject intelligible. A very brief statement of purposes and results, calling attention to the more detailed account is the wise policy with reference to such matters. Do not think that you ought to occupy an amount of time proportioned to the importance of your subject as you see it.

One other point about the best papers for a meeting, they must have variety. Each paper should stick to its particular point, and the discussion on it be confined to its subject. A whole session may be devoted to related subjects. But in a meeting lasting two or three days, a variety of subjects should be considered. This is needful because of the variety of interests that appeal most strongly to different members; and also to keep fresh the interest of the individual mind by change of the direction of activity. "A change is as good as a rest"—may be a rest secured without loss of time. So far as a variety of subject can secure this, it is to be aimed at. Any appropriate topic, that can be presented within the limitations of time and endurance that apply to a meeting, may be made the subject of a paper. It should not arouse unfavorable comment because the subject is out of the usual line.

Once more to emphasize, stick to your point, cut out all padding, write and rewrite to secure brief, clear statements, avoid all preliminary remarks, and stop while much remains that might be said, but when the attention and interest begin to run down.

## DISCUSSION

DR. H. W. LOEB, St. Louis, Mo.: I consider it a privilege to open this discussion, which, as Dr. Jackson states, has a place on a program only once in twenty-five years. I do not expect to be present when the next is read, but at the semicentennial I hope there will be some one to speak with as much authority as Dr. Jackson. This is certainly a wonderful subject. I heartily agree that it is wise not to present matters that are not new. But I must confess that if we carry this to the proper limit there would be little presented at any society meeting. I also agree that it is out of place to present long-winded papers on the so-called "high brow" stuff; but we must have a "high brow" ideal whether we practice it or not, and therefore I feel that scientific papers have a place in a scientific meeting, as well as pictures, drawings and things of that sort. I recall some years ago when the Barany test was a good deal in the literature, no one paid much attention until a certain clever gentleman from Philadelphia presented it in moving pictures, and that had much to do with understanding of the Barany test in this country. Not so recently, a surgeon used the moving pictures on the subject of thyroidectomy. The percentage

of deaths before his plan was adopted was 92; after this plan was adopted it was 64. We must consider this largely due to the moving picture scheme.

I think of two great classes in regard to papers. In the first place, papers are not only presented to be read by the speaker, but to be read also by a great mass of people who read the literature. Spoken papers are different from papers which are read. The speech which you read should be different from the speech you speak, and I think much could be done if we would employ Kentucky oratory in speaking and high class literature in writing.

Another thing is that papers are presented without anything but a continuity of words; no classification of the subject. The man who has a good thing to present and does not classify his topics in some arrangement and does not have subheads to present fails in his presentation, and he will have a poor paper where a classification would have made it otherwise. If the conclusion is postponed until the conclusion of the paper, those who are asleep may awaken just in time to learn something. Col. Garrison told me it was strange that medical men differed from all other men in presenting their conclusions last. They should announce the thesis and then proceed to expound it. Every body remained awake at the presentation of the conclusion at the beginning but went to sleep afterwards. I think he was right in regard to reading, but not in regard to writing it. If everybody, in writing, would undertake this classification into subheads so that it may be presented in a form that will attract, it would be much more effective.

DR. A. H. ANDREWS, Chicago: I want to heartily approve of the position taken by Dr. Jackson in this paper. I think it of great importance, and if we will take it to heart our papers will be better in the future than in the past. It is a good thing for every writer to know the view point of the hearers. Not all know as much about ophthalmology as Dr. Jackson and things he might not be interested in might be of importance to some of the rest of us. Especially in writing for general practitioners it is a good plan to have the material of such a character and presented in such a way that the general practitioner will appreciate it. They all have to do a certain amount of ear, nose and eye work. If you can give them something they can take home to use in their business, they will generally appreciate it and you and they will profit thereby.

DR. JOS. BECK, Chicago: I want to plead guilty to every fault Dr. Jackson found with the writers and readers of papers in the few years I have been writing and reading papers, and I wonder why most of the time I have been asked to write and present them.

The first one he mentioned that struck me was the massive reference to literature. That, I believe, is European training. In the Berlin Clinic we were taught that a paper was not complete until this was done.

I was surprised to have him speak of pathology as he did. I do not know anything so important to the young man in ear, nose and throat work as the study of specimens. We ought to encourage the men who are going out to report on these subjects, especially in

pathology, which is one of the strongest points in our efforts to do good—the basis of everything in my work.

I am glad he spoke of the long papers and reports, and wondered why he did not stick in something about preprofessional programs to give them out beforehand. I have hoped that this society would get these out. We could read these ahead of time, the statistics, etc., and not have to listen or try to carry in our minds the percentages of statistics. You can't make anything out from hearing them, and yet the summary of statistics as to mortality or cures is of great importance. The same is true of changing the slides rapidly on the screen in a medical society. A man who runs a lantern will tell you how many they run a minute. You get tired and the eye will not read as rapidly. The picture should be left on a longer time. I have made that mistake a number of times.

As to the time limit, I have been chairman a number of times and there is a great difficulty for the chairman not to hurt some one's feelings or stretch a point.

The last point: "When you have made your point, stop." I believe it was the American Ambassador Porter who said that in after dinner speaking his experience was to look into the eyes of the listeners and find when they were most delighted with the point he had made, and if it was in but two or three minutes time, he would sit down. Many of us in our discussions don't know when to sit down.

DR. R. H. T. MANN, Texarkana: I am not worthy to discuss so fine a paper as read. I want to say this in behalf of the listeners in societies like this, which constitute the greatest postgraduate school which we men living in the country have the privilege to attend. What we want in these scientific papers is this: we want you men to discover our weak points. In other words, we want you to size up and grade the men practicing Ophthalmology and Oto-Laryngology over the United States and see just where we are lacking in the treatment of cases, where the deficiency exists, and where we are not up to date, and not doing our work as it should be done. Then when you give these papers to us we want the thing which covers our defect and which will the better enable us to go home and cure our patient whom we were not able to cure before, because we did not know how. Some of us are thick-headed. I want to tell you we will go to sleep on certain subjects and won't understand everything, but if you will share with us some of the advantages which you have we will get into step with the age. A lot of pictures will teach us, and don't forget we are in Missouri now, and you can carry no better idea home than this, that we want to be shown.

DR. G. F. KEIPER, Lafayette, Indiana: If Dr. George Simmons, editor of the Journal of the American Medical Association, were here this morning he probably would request Dr. Jackson to publish his paper in the Journal, for Dr. Jackson's paper is a fitting supplement to a pamphlet which Dr. Simmons published several years ago, entitled "Suggestions to Medical Authors," a copy of which I hold in my hand. We all should aspire to medical authorship for we owe it to our confreres to put upon the printed page the experiences which we are encountering as we pass along the path of life. Freely we have

received, freely we ought to give of our own store of information. Then, again, the reflex influence of authorship is very valuable. The late lamented President Harper of the University of Chicago once said that if he wished to find all about a subject, he wrote a book about it. In other words, he learned so much from his research about the subject in hand that he could not help but write a book about it. Dr. Jackson's valuable paper and Dr. Simmons' equally valuable pamphlet form, are two excellent texts on English Composition as applied to Medical Authorship.

DR. JACKSON, (closing discussion): I think as a model of what a paper before a society should be, I would choose Gunn's first note on the changes in the retina in arteriosclerosis. It occupies only two pages of the transactions of the Ophthalmological Society of the United Kingdom. Nothing is said about arteriosclerosis in general, but he makes perfectly clear the changes to which he wishes to call attention. If you hesitate to cut down your paper to what should be its proper limit, remember that paper by Gunn has been quoted fifty times, when papers of 200 pages have not been read.

An instance of the kind of paper to be aimed at, and the way you should handle your subject will be heard in the ophthalmologic section this afternoon, the first paper on the program. We know the work of the man who is to read it, and it has these desirable characteristics.

The point has been made that there should be a difference in the writing of a paper, according to whether it is to be read from the printed page, or is to be listened to. That difference should be made. If it were possible for all our societies to introduce the presessional printing of papers, it would add greatly to the intelligence of the discussions. We would make much better use of the time when two or three hundred of us gather in one room if we had such printed copies.

Dr. Beck has spoken of being guilty of all these faults. If I had not felt I had also been guilty, I could not have spoken so freely of them.

The point was made that this is actually a graduate school for most of us, and that is a very important thing. That idea ought to be clearly in the minds of the officers, and particularly the program committees that arrange for our meetings. The discussions should be so arranged that the needs of the profession will be met. The speaker should remember what his hearers have learned and what they are interested in and want to learn.

## PREPARATION OF OPHTHALMOLOGISTS FOR GROUP PRACTICE

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SECTION ON OPHTHALMOLOGY

MAYO CLINIC, ROCHESTER, MINNESOTA

The formation of clinical groups by physicians for the diagnosis of disease and the treatment of patients is one of the newer features of medical progress. The forces behind this movement have been active since the beginning of specialization, in fact they originated in specialization, and have gained power with each new discovery and each bit of scientific advancement. Specialization in medicine became necessary when the fields of investigation of disease processes in man were extended by the invention of optical instruments and the development of the various branches of chemistry. The invention of the compound microscope opened the way to all our knowledge of histology, histopathology, and bacteriology, and incidentally revolutionized the conception of disease transmission. From the ever-widening fields of chemistry and biology came new and practical methods of investigation and examination of body fluids, secretions, and so forth, and rules for their application to the problems of medical practitioners were instituted.

Medical men ever have been quick to grasp tools from scientific discoveries in whatever field they may be found. Men who had been educated and trained in the practice of medicine voluntarily shut themselves off from actual practice and devoted their time and talents to the investigation in the laboratory of influences bearing on the cause and transmission of disease in order that through greater devotion to a limited field they might add materially to the science of medicine.

The laboratory service now requires the full time of men of high grade intelligence, of liberal acquaintance with fundamental sciences, and wide knowledge of the advances in clinical medicine and surgery. All are familiar, of course, with the development of laboratories and all recognize their usefulness. Methods of physical examination have been improved by checking physical findings with laboratory findings. "The function of the clinical laboratory worker is to aid the ward worker. The findings of the former are seldom conclusive,

and must be interpreted in the light of the ward findings; especially is this true now that functional diagnosis is the goal.<sup>2</sup> No one will attempt to estimate the distinct value of laboratory training in our interpretation of bedside observations, but no one who has had laboratory training denies the miserable darkness through which he would have to grope had he not had it. The pathologist is not indispensable to the surgeon, and the physiologic chemist is not needed in the majority of cases studied by the internist, but the aids to diagnosis provided by what the pathologist and chemist have taught us are constantly employed to make clear the significance and relationship of symptoms and signs of disease that would otherwise remain obscure. Let us deny that we are bound to the laboratory, but admit that we are better physicians because of what we learned in the laboratory. Let us admit that we learned in the laboratory because someone before us had limited his field of investigation that he might develop it the more, and we, thereby, conceive the value of specialization.

The study of fundamental sciences and their application to health problems early became a specialized feature in the study of disease. Development of the fundamental sciences gave new methods of study of clinical problems. Physicians then limited their practice to fields in which by employment of highly specialized knowledge they had become more proficient. Although their practice was limited, their study was broadened. Practitioners in special fields spend more time and study in preparation for their work than is required for general practice. Clinical specialties, then, are not deviations from general medicine; they provide ways and means for better practice.

The first division of general medicine into laboratory, medical, and surgical fields was quickly followed by further divisions until now the list of specialists has become quite long. Yet the basis on which such divisions have been made is obvious in the light of the time required to master the technic of a subject and keep abreast of the special advances, to say nothing of adding to the knowledge we already have by carefully planned and efficiently executed research.

Specialism, as it is practiced today in ophthalmology, otology, neurology, urology, and other well established branches of medicine, needs no argument for justification. No practitioner claims to be equally versed and proficient in the various

departments of medical practice. He has come to rely on the opinion of specialists for the diagnosis of the more obscure diseases of his patients, and often of their treatment. The field of study of each specialist is, however, not confined to the organ or system upon which he prefers to specialize. The condition of the kidney is of importance to an expert in cardio-renal disease, the teeth to the gastro-enterologist, and the eyes to the neurologist; in fact, all specialties are so interwoven that the examination in all departments is of value in complicated or severe illnesses. The patient's general physician alone cannot hope to bring to light the early changes that bear upon the patient's condition, so it has become quite common to have a patient go from one specialist to another for examination and opinion.

With specialism thus justified, the next step toward better service is the association of competent specialists. An ophthalmologist may report to an internist that his examination of the patient who was so kindly referred to him reveals the fact that the patient has a diplopia and lowered visual acuity. He may go even further than that. He may report that the patient has a paralysis of an external rectus muscle and a neuroretinitis, and that he has tested the patient's refraction and prescribed glasses. But does that satisfy the internist? Hear what he says: "Seldom in their reports to us of patients we refer to them do ophthalmologists note how sensitive or anesthetic is the macular region when a ray of light is thrown on it. We always test that for ourselves, and it sometimes helps us in determining by further examination some past forgotten illness. It is very seldom that they report on the stippling of the macular region which dates back in a nephritis of pregnancy years ago. It is seldom that they note the slight traces of an old neuroretinitis."

The opinion of an ophthalmoscopic picture given by an ophthalmologist will be weighed by the internist and credited in the light of what he knows of the skill behind that opinion. So an internist usually selects one oculist to whom he sends his cases. The consideration of the specialist's opinions is the ground work of group diagnosis. Such diagnosis is practiced daily in our hospitals. The recommendation of the College of Surgeons that hospital staffs have frequent conferences is another movement in the direction of group diagnosis.

It is significant that many clinical groups are made up of



men who served in camps or base hospitals of the army during the world war, where they learned to contrast the value of cooperative effort in professional achievement with the rival practice in private as a means to personal prestige and competence. Recent graduates who have completed an internship in a general hospital and two to five years of post-graduate study in a clinic are the most ardent advocates of group practice. Experience has shown them the value of highly specialized training and the benefit of expert opinion in specialties other than their own. The value of group study among nonorganized physicians is not disputed. Group study by an organized group of physicians will not be condemned when such organization is perfected by men of ability for better service on an ethical basis.

The university hospitals of our medical schools are organized groups for group study. The University of Michigan Hospital has recently inaugurated clinical conferences which are open to the physicians of the state for discussions of cases. It is commendable in small communities that the physicians should quickly follow the examples of their teachers and organize similar diagnostic groups. I do not know what the general experience may be, but my own experience, limited in years, although diversified in territory, leads me to state that county medical societies do not fill the place demanded for group work. Splendid scientific programs are often held, but we may as well be fair with ourselves and admit that as brass tracks they are highly upholstered. The clinical conference is as necessary in group study as the meeting of a board of directors of a corporation; specific cases are discussed and reviewed to the benefit of the patient and the physician. Such conferences must be held in strict confidence and in all sincerity. Only those who have lived in these conferences can appreciate the true value of them. The knowledge of each man is called out to its fullest width, his training and powers of observation laid bare, and his true worth made manifest to himself and to his fellow practitioners. These conferences become schools of instruction, where all are teachers and at the same time pupils. The study and diagnosis of disease by specialists is better carried out if these specialists are in organized groups.

The majority of groups that are being organized have the benefit of the patient as the basis. Better diagnosis, quicker service in the office, and better hospital service are secured

by closer cooperation. More men are enabled to devote their time to a special service and thereby markedly improve their efficiency. Men who unite in a group usually spend some time attending postgraduate schools to brush up in special work, and more time in visiting other clinics and attending scientific meetings. The average physician is made better by this postgraduate study and through the group practice opportunity is offered to many who, if they continued in private practice, would not spare the time nor money necessary to take it.

In discussing group practice I leave out of consideration the financial adjustment. There is too much to be said on both sides of this issue to go into that here. My personal experience in the formation of a small group and working in a large group convinces me that satisfactory financial arrangements can be made. I will only say that the ideal way to practice can be followed, will be followed, to the financial betterment of some and at a loss to others, but the same spirit of self-denial that leads able specialists to hold positions with small salaries in our medical schools, denying themselves the luxuries that would come from their incomes in private practice, will lead other men to positions of honor in service in groups of clinical workers.

What is the position of ophthalmology in such groups and what training in ophthalmology is necessary to fit a physician to carry the responsibility of oculist in such a group? Ophthalmology is the oldest and most highly specialized of the divisions of clinical medicine and more likely to be practiced independently of general medicine, yet no phase of the work is really independent. The signs and symptoms of bodily disease that are gathered by examinations of the eyes are too well known to be detailed here. External examination of the eyes, examination of the fundus, and testing of refraction all have a place in the general examination of a patient. Fergus says: "Personally, I would not regard a man as fitted to enter the profession of medicine unless he could use an ophthalmoscope to examine the fundus. It is the use of the ophthalmoscope as an instrument of medical research rather than of ophthalmic investigation that is of importance."

The treatment of most ocular diseases can be carried out better by an internist or specialist in another field than by the oculist. In the present day of special practice no oculist is justified in independently treating syphilitic diseases of the eye, tuberculosis of the eye, metastatic infection, endocrin dis-

turbances, neuroretinitis, choked disc, disturbances of the motility of the eye, or even headaches with error of refraction. The ophthalmologist, on the other hand, can be of marked service in treating systemic disturbances. All patients with cardiovascular-renal disease, hypertension, nephritis, diabetes, diseases of the blood and of the blood-forming organs, diseases of the central nervous system, syphilis, tuberculosis, diseases of the skin, and pregnancy should have as part of their routine examinations careful external and ophthalmoscopic examinations by specialists who know the details of the findings of the internist or other examiners.

Batten prophesies that "further progress in ophthalmology, as far as one can see, will be mainly on medical lines, and will require men with a physician's training and experience." The desirable amount and character of training required to fit a man as ophthalmologist in group practice is stated in a quotation from Fergus: "Lastly, the ophthalmic practitioner should know all the symptoms in the organs of vision which indicate systemic diseases or diseases of the brain and nerve system. No man can learn this amount of work unless he has had a training in an eye clinic and in pathologic and physiologic laboratories for at least three years. A man, in my opinion, has no right to be regarded as a specially qualified ophthalmic surgeon unless he has spent three years at clinical ophthalmology and in laboratory work."<sup>5</sup>

Seventeen of the leading ophthalmologists of this country answered an inquiry as to their special preparation in ophthalmology after graduation and before taking up private practice and gave their opinions on the time necessary for special study today. The shortest preparation was three years, the shortest advised one year. The longest preparation was ten years, the longest advised six years. The average preparation was five years, the average advised from three to six years.<sup>6</sup> It is estimated that there are nearly 4,000 long-term graduate students in the United States this year who wish to prepare themselves by two or more years of study for practice in some special clinical field.<sup>7</sup> "Most of these men need opportunity to work alone, not in classes, though under general supervision, for six months to a year in one or more of the fundamental branches. Then they need clinical material and laboratory and library facilities for two or more years of intensive work in diagnosis and treatment. They need personal responsibility for patients, inspiration to in-

vestigation, keen criticism and opportunity for fearless discussion with real leaders in their specialty. They need little, if any, formal teaching, of which most of them have already had too much."<sup>8</sup> The opportunities for such instruction in ophthalmology are woefully lacking, but if the specialty is to keep abreast with other fields in group practice, the need is apparent. Dr. Parker at the University of Michigan was, I believe, the first to realize this need and inaugurate a regular three years' postgraduate service in a University. The University of Colorado offered a University degree in Ophthalmology after two years of special study. The University of Minnesota followed by offering a University degree after a three-year service, later offering the degree of Master of Science after two years' service and the degree of Doctor of Philosophy after three years' service. An internship of one year, preferably in a general hospital, however, is required for eligibility to fellowship.

It is immaterial whether a university degree be offered for special work in ophthalmology. That is a question to be decided by other minds and lies outside the purpose and scope of this paper. The trend of the times, however, is strongly toward more preparation, longer time spent in clinical work, and more attention given to medical phases of ophthalmology. The student wants patients, not lectures; cases, not books, and opportunity to study cases with the internist and other specialists. Six months to one year may be spent with profit in fundamental sciences, anatomy, physiology, pathology, bacteriology, and physical and physiologic optics, and from two to two and one-half years in clinical work and research. The University of Minnesota provides nine months in the fundamental branches and twenty-seven months in clinical work. Six to twelve of the twenty-seven months are devoted to work in a subject, as a minor, related to ophthalmology. The fundamental work is given in the University by department heads and capable assistants, the clinical work at the University and at the Mayo Foundation in Rochester. The closest possible relationship is maintained at the Mayo Foundation and Mayo Clinic between the specialties by a connecting link; graduate students with majors in ophthalmology are assigned to sections in medicine, neurology, and so forth, for study in their minor subjects. In addition to this students in other specialties are given twenty-four hours in medical ophthalmology and ophthalmoscopic demonstrations. The ob-

ject or the latter is better to acquaint the internist and others with the importance of ophthalmology as a diagnostic aid and to encourage the employment of an ophthalmologist in consultation practice. The more familiar the internist becomes with ophthalmology as a diagnostic aid the more will he require of the ophthalmologist. To the general surgeon, and particularly the neurologic surgeon, the ophthalmologist's work is invaluable, but must be of high merit.

In conclusion I would emphasize the following points:

1. Group study in medicine is necessary for the employment of the best diagnostic methods.
2. Group practice carries the same advantage to the patient in therapeutics as does group study in diagnosis.
3. Greater preparation is being sought by men who wish to specialize and take up group study and practice.
4. The position of ophthalmology in group study and practice is of the utmost importance.
5. The greatest advances in ophthalmology to be made in the future will be along medical lines.
6. More intensive training in medical ophthalmology is required to fit men for special work in group practice.
7. Graduate courses in ophthalmology covering periods of two or three years should be offered in hospitals and clinics throughout the country, to provide opportunity for students who desire to prepare themselves more efficiently for group study and practice.
8. Closer cooperation between ophthalmology and other specialties should be fostered in hospitals and clinics.

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#### DISCUSSION

DR. F. PARK LEWIS, Buffalo, N. Y.: There are two distinct ideas in this very excellent paper of Dr. Benedict's: first, as to the desirabil-

ity of group practice; second, the desirability being admitted, the special training required for the ophthalmologic member of such a group.

There was a time, a generation ago, when such a question would not be raised. All men engaged in special work were supposed to be well grounded in the principles of general medicine. Some of the most noted representatives of that period, such as Jonathan Hutchinson, Clifford Albutt, and Sir William Gowers, while preeminent internists, yet were able to add observation of permanent value of pathologic changes in the eye. The entire field of medicine has been so enlarged since that time, that it is perhaps too much to expect that the young ophthalmologist will be as fully equipped as a clinician as he is in his own department, to which he has given intensive study. He has something to get as well as something to give in the consultation of the group, the importance of which Dr. Benedict very properly emphasizes.

As practically every intraocular disease that is not traumatic or refractive is of extraocular origin, it is self-evident that the eye man must have the collaboration of his colleagues. As the eye findings are of such essential value in brain and spinal conditions and are important in other diseases, his help must often be required by the internist or surgeon.

There can be no question as to the desirability of obtaining light from every angle when the diagnosis is difficult or obscure. Indeed, it is when the trouble is apparently obvious that complete examinations sometimes bring out important elements that would otherwise have been overlooked. All of this is capable of practical application in a clinic or hospital. In private practice it is quite another matter.

The entire practice of medicine cannot be carried out on the group system. The individual physician will still have his work to do and he must be considered. What must be his relation to the group?

It must not be forgotten that when the group *treats* as well as *diagnoses* disease it at once places itself, not in cooperation, but in competition with the rest of the medical profession. The reference of a patient to such a group means the loss of the patient to the referring physician.

The patient is apt to return to his home with an exalted idea of the remarkable skill of the group and with a diminished appreciation, often quite unjust, of the ability of his own physician.

I would not be misunderstood. There is undoubtedly a place in many of the larger cities for one or more organized groups for the practice of medicine and surgery. There is no special training which the ophthalmologist should have as a member of such a group, that is not equally necessary for him to have as an individual specializing on the eye. He must know its relationships as well as its local diseases.

If, on the other hand, the work of the group be limited to diagnosis with helpful suggestions, always through the family physician as to measures of treatment, the whole medical profession is thereby raised to a higher level. Each case, studied by all together in that way would have a definite educational value. It would require

a certain degree of altruism on the part of all of those engaging in such diagnostic work, because to have it reach its highest value it should be accomplished impersonally, even the names of all of those constituting such a clinic should be kept in the background. It would then be a distinct encouragement for all physicians to bring their most obscure cases for investigation which they might do with safety, and the combined study of such cases would result in the added prestige of the family physician rather than in his disparagement.

There would then be genuine cooperation on the part of the whole medical profession which would not only be of distinct advantage to the patient but would be of benefit to all taking part in such group study.

DR. ALLEN GREENWOOD, Boston: I think we owe Dr. Benedict a debt of gratitude for bringing this question before us, with its many important bearings. Two points I wish to discuss.

First, as to the element of time. There is no limit to the maximum time, except the completion of a man's professional life. The minimum can be fixed somewhat according to those who are given postgraduate work and the limit there depends upon the individual to a large extent. Many men in a moderate length of time are ready to go out and carry on the practice of ophthalmology. The maximum we have spoken of is not sufficient for some men. It also depends upon where a man is going to settle. If he locates where he can meet with other men, as on the Staff in an Ophthalmic Hospital, he is then under training all the time he is connected with the Hospital and his postgraduate work need not be so prolonged.

The other point, with regard to the general practitioner using the ophthalmoscope, I have seen a good many who could use it, but when it comes to a question of careful diagnosis, that should depend on the man who is using the ophthalmoscope hour by hour. A case in point: A neurologist advised a surgeon to operate in a brain case because there was 4 D. elevation of the disc. It took 4 D. in the ophthalmoscope to see the discs, but it also took the same to see the rest of the fundus. He had not thought to measure the rest of the fundus. When it comes to the final test in group practice the ophthalmologist must be the final judge, in most cases, of what the ophthalmoscope teaches.

DR. MEYER WIENER, St. Louis: This subject is of intense interest to all of us, and no one who has had any experience in group practice will doubt the advantage of associating with a group of ophthalmologists as well as of the group itself.

Dr. Benedict pointed out the necessity of a detailed report and examination of the patient's eyes, and that is something to which enough importance is not given by the average man reporting his findings in the examination of the eye upon request. There is something more than the detailed findings of the examination of that eye. I think it of great advantage to the group, even if a diagnosis cannot be made, to have at least an impression or recommendation given in the summary of the report. An effort should be made in that line by an ophthalmologist, to give in the summary an impression even if a

diagnosis is not reached, and a recommendation as to what procedure should be done and what the findings mean.

With regard to the importance of practical work, I heartily agree with Dr. Benedict that the proper training of a man for group practice should be practical. He does not want to sit down and be content with the teachings from text-books, but he should see cases and they should be supervised by the men under whom he is getting his training. The cases which Dr. Lewis mentioned about the choked disc is just an example of the changed report on these findings. If the examination had been properly made there would have been no question as to choked disc or not.

DR. J. O. McREYNOLDS, of Dallas, Texas: We could hardly at this time have a more important subject for the entire profession than that so ably presented and discussed. I feel especially like emphasizing the views brought out by Dr. Park Lewis. This can be so adjusted so as to help the entire profession and ophthalmology especially. It is impractical to divide the profession into hard and fast distinct groups. Some way must be arranged by which all the advantages of group practice may be obtained, without the use of hard and fast groups. The ablest men in every line should be available. It would be of advantage if we could give each man in the profession the widest possible consultation, and it would be of advantage to the patients as well.

DR. JOS. LICHTENBERG, Kansas City: I want to express my thanks to Dr. Benedict for bringing up this subject, as I think it is the highest type of criticism. I simply want to state how we practice in St. Joseph's Hospital in Kansas City. Not many of us here have in our own office a hard and fast group, but in our hospital the staff is divided into two groups. When we have a case of obscure origin, it is sent to this hospital, and the case is gone over by the group with whom I am associated. The diagnosis is made and the treatment is assigned to the department to which it belongs according to the diagnosis at which we have arrived. This can be done in many places and it answers the purpose admirably.

DR. BENEDICT (closing discussion): I have no doubt many men would do much better outside a group than in one. On the other hand, too, many financial questions arise, especially with men who already have an established practice. The younger men are going to have to do their work much better than has been done by the average man coming from a postgraduate school. The question of men in general practice is one in point. While it happens frequently that a neurologist will make a mistake in diagnosis of the fundus, it also frequently happens that the neurologist and the internist will make a better report of the fundus than the ophthalmologist. Particularly I want to emphasize that the younger ophthalmologists are going to have strong competition. Internists are now trained by ophthalmologists in the hospitals and more internists are able to use the ophthalmoscope than heretofore.



## THE NEED FOR MORE THOROUGH TRAINING IN OTOLOGY FOR UNDERGRADUATES IN MEDICINE

HORACE NEWHART, M. D., F. A. C. S.

MINNEAPOLIS

Medical education up to the present time has largely failed to qualify the general practitioner to properly apply the elementary facts of otology in his daily work. This rather arbitrary statement is made with a full appreciation of the splendid facilities for teaching the subject possessed by not a few of our Class A medical schools, and with all respect to the many skilled specialists who are giving generously of their time and enthusiasm to the teaching of this, from a didactic point of view, difficult branch of medicine. That this assertion is justifiable and that it is of vital interest to everyone whose special field of practice includes diseases of the ear is obvious when one considers the status of otology in America to-day.

The Association of American Medical Colleges in its prescribed curriculum of a minimum of 3,600 hours for the four years course has allotted one and one-half per cent of the total time to the combined subjects of otology, rhinology and laryngology. Since the approximate average total number of hours is 4,500 instead of 3,600, the minimum required time allotted to these three subjects is sixty-seven hours. An equal amount of time is apportioned to ophthalmology alone, probably because this was originally the first of the surgical specialties, and its teaching needs are better understood. No one would presume to suggest, in view of the importance of the subject, that this is too much time. The fact is mentioned only for the sake of comparison.

Assuming that this period of sixty-seven hours provided for oto-laryngology is equally divided, in a generous spirit of fairness between otology on the one hand and rhino-laryngology on the other, which is actually the case in a number of our schools, we have available for instruction in otology, both didactic and clinical, the significantly small total of thirty-three hours! The absolute insufficiency of this limited time for the teaching of even the rudiments of so important a subject sug-

gests forcibly the probability that those who first made the suggested allotment of time overlooked certain facts well known to clinical instructors of the present generation. Diseases of the ear, nose and throat are among the commonest maladies with which the general practitioner has to deal, especially in the young, and their early diagnosis and treatment by the family physician demand a certain amount of specialized technic and skill in instrumentation which is to be acquired only by the same sort of clinical experience which is abundantly provided for him in other departments of applied medicine. Very many cases of impaired hearing observed in adult years are due to inflammatory ear diseases occurring in infancy and early childhood. The most frequent cause of septic meningitis is the neglected or unrecognized suppuration in the middle ear or accessory nasal sinuses. In the teaching of otology we are dealing with an organ which is difficult of access and demands time-consuming procedures for its proper examination and demonstration, and whose pathology we can often demonstrate to only one student at a time. For accurate diagnosis and for controlling the results of treatment, frequent functional tests are required to be done in detail many times by the student before he attains proficiency. From these and from other facts, it becomes clearly evident that an adequate amount of time and an ample staff of inspiring teachers must be provided, if we would properly prepare the undergraduates in this branch.

An examination of the recent departmental announcements of more than fifty Class A medical schools, shows a wide discrepancy in the amount of required work in otology, which varies from a total of but twelve hours of lectures in one of our great metropolitan schools (the clinical hours being entirely optional) to eighty-six hours of required otology in a school whose late lamented dean was himself an otologist of note. In only seventeen schools do we find that this subject is given such prominence that it is considered worthy of being taught as a separate clinical unit. Nine colleges still adhere to the traditional system of combining instruction in diseases of the eye, ear, and nose in one clinic, a method which may have been justified only in the earliest days in the evolution of these surgical specialties. In twenty-nine schools it is still found expedient to combine the clinical work in otology with that in rhino-laryngology, a system possessing both its advantages

as well as its disadvantages, the latter coming through an inability of both student and teacher to do intensive work on but a single subject. In twenty-seven colleges the combined teaching of otology and laryngology is allowed less time than is given to ophthalmology.

While in many institutions it must be granted that the subject of otology is ideally covered, in the majority of our schools there is yet much to be accomplished. It is worthy of note that in three schools in which otology is conspicuous because it is not slighted, the dean has been a teacher of this subject.

Largely in consequence of the insufficiency of his knowledge of ear diseases, the general practitioner, as soon as he finds compensatory work in other lines, usually acquires or assumes an indifference toward ear diseases which is highly detrimental to the best interests of the medical profession and to the public alike. This indifference is partly accounted for by his frequent failure to attain any noteworthy success in dealing with chronic cases, of whom the vast majority, ignorant of the advantages of early diagnosis and treatment, seek relief only from their most noticeable or painful symptoms when it is too late to give them noticeable help.

The one great outstanding task of modern otology is the conservation of the integrity of the ear as a special sense organ and the prevention of death through its involvement in suppurative disease. How very inadequate have been our attainments in the meeting of this problem is convincingly shown by the wide prevalence of neglected ear diseases even at the present time. It is conservatively estimated that there are in the United States no less than 3,000,000 individuals with hearing so impaired as to be a noticeable handicap in their social intercourse and in their economic efficiency. Medical inspection in our public schools has disclosed the fact that from two to six per cent of children of school age have discharging ears. How many needless deaths occur annually in our own country from neglected middle ear suppuration, we have no means of determining; but the undisputed statement of Prof. Koerner that four per cent of all deaths registered in Prussia among persons under the age of thirty years results from ear diseases, is most significant. The admission that the majority of all ear diseases are preventable by the timely application of knowledge and skill, which should be possessed by every man assuming the responsibilities of a general practice, is incrim-

inating evidence of our inefficiency and a most convincing argument for more thorough training in otology than is given in the average medical school.

During the last decade the additions to our specific knowledge in otology have been fully commensurate with the progress made in other branches of medical science. Not the least important advance has come through a realization of the fact that the ear can no longer be regarded as an isolated anatomic and physiologic unit, to be separately dealt with, but that it is a most delicate, highly specialized organ which is very susceptible to damage from the harmful influence of toxic disturbances originating in other parts of the body, such as focal infections, systemic diseases, faulty metabolism, impaired function of the ductless glands, and cardio-vascular and renal diseases. Thus the early recognition and successful treatment of many of the noninflammatory ear affections, not infrequently call into play the diagnostic and therapeutic resources of internal medicine. The clinical facts already established concerning the static-kinetic labyrinth have also added another new chapter to otologic knowledge. All this demands a revision and expansion of the subject matter of otology and necessitates a substantial increase in the number of teaching hours to be allotted to the subject.

The recent awakening of popular interest in the betterment of the race through attention to the physical needs of the individual implies that the physician carry a larger responsibility than ever before in regard to preventive medicine. To prove himself worthy of the utmost confidence of the public, he must manifest an active interest in the conservation of their special sense organs as well as of their general health.

The benefits to accrue to the public from improved instruction in otology have already been made clear. Likewise the advantages to the general practitioner have been suggested in the broader and more effective interest in medicine which his possession of a larger knowledge of otology will yield.

It is the oto-laryngologist himself, however, who is chiefly concerned in a more thorough training of the undergraduate in the fundamental principles of our subject. To him will result the greatest individual benefit, for he will receive more fully than in the past that which he has especially lacked to place his work upon a satisfactory basis; namely, the support and cooperation of the family physician. When the latter is better trained, he will have a fuller appreciation of the specialist's

problems, and will be ready to help educate the public to the absolute necessity of early prophylactic and therapeutic care in the successful combating of ear disorders. He will be constantly on the alert to detect all possible factors which may produce ear disorders in his patients and will be quick to suggest or provide the remedy.

That the general practitioner will ever seriously invade the field of the specialist is not to be feared, for the successful physician is too much occupied with other more alluring subjects to be tempted to give adequate detailed attention to his ear cases, whenever there is a qualified specialist accessible. But in communities in which there is not a man possessing specialized training in this field, the duty of the general physician is obvious.

Instruction in otology for undergraduate students, in order to meet the real needs of the situation, should be standardized. The matter of standardization is a proper subject for a committee constituted similarly to the committees who have already accomplished much to raise the standards of postgraduate work in ophthalmology and oto-laryngology.

The didactic and clinical teaching in otology in all of our colleges should measure up relatively in quality and quantity with instruction in other medical subjects. That this may be accomplished, there must be provided in the majority of our schools a material addition to the number of teaching hours now allotted to this subject.

A study of the departmental announcements of our Class A schools, and frequent inquiry among students and graduates of various colleges as to how far the instruction they had received had met their needs, together with an experience in attempting to teach otology under the adverse conditions imposed by an ever-crowded curriculum and a numerically inadequate staff prompt the following conclusions:

A minimum of from twenty to twenty-four hours should be allowed for didactic lectures covering the fundamental elements of otology in order to meet even the moderate requirements of the general practitioner. This should include a presentation of the accepted facts of neuro-otology in so far as they may be of service to him in his regular work. In schools in which there is no separate department for defects of speech, at least one hour of the didactic work should be given to this closely allied subject, which is practically ignored in all but a few American schools.

Clinical instruction, chiefly in small sections, with an ample number of interest inspiring teachers, to supervise the work of each student, should be provided for a period of at least twenty to twenty-four hours. It has been proven, at least to the writer's satisfaction, that any shorter period of instruction does not permit the average student to acquire enough proficiency to enable him to creditably carry on the practical work in otology which may be delegated to the man in general practice.

No argument is necessary to demonstrate the importance of having the didactic and clinical work in rhinology and laryngology precede instruction in otology and that the didactic instruction in otology precede the clinical work. A failure to thus coordinate the work exists in too many schools.

Elective courses in otology for undergraduate students are undesirable as tending to promote too early specialization. The subject matter of such courses should rather be embodied in courses for postgraduate students who are intensively preparing themselves for the work of the specialist.

The spending of many hours in watching the details of operations on the mastoid, or procedures for the relief of endocranial complications, which, as a general practitioner he should never be encouraged to perform, is largely a waste of the student's time, in view of his need for attaining the greatest possible proficiency in such less spectacular procedures as history taking, direct otoscopic examinations, functional testing and treatment of the commoner ear complaints.

The aim of all undergraduate instruction in otology should be to make the general practitioner a safe and dependable man in the doing of such work as properly lies within the limitations of his sphere, and is emphatically not to graduate him a premature specialist.

The realization of any of the ideals for the future status of otology as suggested by this paper is largely dependent upon the influence of the members of this Academy, the largest and most representative body of oto-laryngologists in the world.

## DISCUSSION

DR. JOS. BECK, Chicago: It is now about twenty years since I have been attempting to teach undergraduates in the University of Illinois, and for the past five years I have been ready to quit, and possibly in another year I may have to quit. Why I make this statement is that I believe the best universities, and I know that Illinois University is contemplating doing the same, namely, have half

or full time teachers. One of the reasons is the small amount of time we are giving to the students. It is not alone that the curriculum is small, but the number of good teachers willing to give the time to clinical instruction is small. It is difficult to get good, active and well trained men to go to dispensaries. I for one don't want to go there and that is where the undergraduate is getting his instruction. There are many present, of whom Dr. Loeb is probably the best qualified to talk, and I hope he will talk to us about how the American colleges went about giving more time to this subject of otology. The otologists have always known there should be more time given, and every branch thinks his is the most important. The fact is that the most unsatisfactory teaching is being given in otology, or they have had no instruction, and that is the worst of it. There is a building under construction now, at the University of Illinois, in which we expect to demonstrate to our students in rhinology and oto-laryngology rather than in talking over their heads. In Cook County where Dr. Boot is teaching they give the smallest number of hours to this important subject. When we oto-laryngologists meet at our faculty meetings we listen and do not say much, because we have no chance.

DR. H. W. LOEB, St. Louis: I can approach this subject from the dual standpoint of an oto-laryngologist and administrator, and I must say that for the last fifteen years I have considered as the most important of these dual capacities of mine the administration side. I have been to meetings like this and heard discussions as to the advisability of increasing this, that and the other work for the standard; but as a matter of fact, schools are doing different work than years ago when they were manufacturing doctors to practice medicine. They are doing nothing of the kind now. No medical school in existence today attempts to educate any student for anything more than an intern. All the student expects to do when he gets into practice depends on his work as an intern. We must teach our students to be interns. Ninety per cent of the graduates of our medical schools become interns. Twenty years ago not twenty per cent became interns. That means putting the more important work of the specialties into the intern work so that when they become interns they will know the method of procedure, the anatomy, the pathology, the diagnosis, as much as they have not forgotten. No man in a medical school can learn to do in school what Dr. Newhart wants him to do, if he has not had a year of intern work. I want to emphasize this thought, that nowadays medical schools are educating men to become interns, and that changes the whole aspect of this subject. I surmise that within two years a year of hospital work will be a requirement for every man who graduates in medicine, and then ophthalmology, otology and laryngology can come into their own.

DR. G. W. BOOR, Chicago: I have been engaged in teaching ear, nose and throat work for seventeen years and during that time have acquired some decided opinions about teaching. In the first place, the people who have worked out the time allotted to the specialties have succeeded very well. It is perhaps not quite just that orthopedics should have 80 hours, while ear, nose and throat has but 67; but the time is enough to teach the student who is going into general

practice the rudiments of our specialty. We should use our time to the best advantage if we would get the most out of it. Time spent in giving lectures is time largely wasted. It would be spent to much better advantage reading up the subject in some good text-book. Time spent in doing mastoid operations before a class is time largely wasted. One mastoid operation is enough to show a class of undergraduates. They cannot see what is being done anyway. If you will see that each student has access to a good text-book, assign subjects to be looked up in the text-book and then have him spend his whole time in clinical work with patients in the dispensary you will get much better results than by having students listen to lectures and watch operations.

The following is a plan I have followed with a class of students that I had for three months, two hours weekly. The first day each student was told that he must have access to some good text-book. He was required to own a head mirror, two sizes of throat mirrors, a set of ear specula, a nasal speculum, a metal tongue depressor and an applicator. At the beginning of the first hour he was told how to hold his instruments, then assigned a patient upon whom to practice what he had been told. He was told what to look for in the normal ear, nose and throat. I passed around the class seeing that each student went about examining his patient correctly. The second hour and each hour afterwards the student was assigned a patient and required to examine the ears, nose and throat for first half hour. Then the class was assembled and each student presented his patient and told what he found. As the student told what was to be seen I examined the patient before the class and confirmed what the student said or pointed out to him where he was wrong. If he had not seen the important points that were present he was again set at examining the patient and required to continue examining until he saw what was to be seen. If the case presented anything unusual each member of the class was required to see the peculiar thing.

In addition to this at the beginning of the term each student was given some subject for a term paper. This was to be handed in during the last week of the term. I took good care to see that these subjects were such that they could not be copied from the text books. Such topics as "The Structure of the Ear in Birds." "Do Fishes Hear?" "How do Insects Hear?" and the like were assigned for these papers. In addition to this students were often required to write reviews of important papers such as Wilhelm Meyer's original paper on adenoids, Hutchinson's original paper on Hutchinson's triad and so on.

The objects of these papers were two: to get the student to go to the library for the original epoch making papers and to get them to see that there is vastly more to our specialty than they might imagine if they saw nothing more than the text-book.

The result of this plan of teaching was a class that knew more about ear, nose and throat diseases than any class I have ever seen taught by any other method, and they knew they knew it. It was not mere text-book learning but first hand knowledge. They doubtless "cussed" me behind my back but the results justified the means.



## SOME VARIANT FORMS OF KERATITIS

G. E. DE SCHWEINITZ, M.D.

PHILADELPHIA

Superficial punctate keratitis, originally established in Vienna twenty-one years ago as a clinical entity, especially by Fuchs, in typical development manifests the following symptoms: A sharp, nonpurulent conjunctivitis, often associated with catarrhal disease of the respiratory tract, is followed in a few days or weeks by the elaboration of small punctiform or linear spots (ten to one hundred in number), dependent upon necrotic leucocytic infiltrations beneath Bowman's membrane (Verhoeff), gathering usually in the central corneal area, over which the corneal epithelium is slightly elevated. The progress of the disease is tedious, lasting for weeks and even months, is subject to exacerbations, which ultimately cease, and the spots disappear without leaving a trace of their former existence. Usually a bilateral affection and more common in young subjects than in elderly people, iritis in the ordinary sense of the term does not occur. Although corneal ulceration is rare, the punctate spots react to fluorescein staining; corneal hypesthesia is demonstrable.

Two clinical variants from the type disease possess certain interesting features. One is the following: In the third stage of the evolution of the corneal lesions, a number of small, pit-like oval ulcers form, differing in appearance from the fluorescein-stained spots, and not preceded, at least none has been observed, by vesicle formation as it occurs in herpes corneae febrilis, and associated with a distinct ciliary flush and sharp irritative phenomena. In the cases noted the disease was unilateral. The lesions yielded to mydriasis, holocain (especially valuable), and internally salicylates. Respiratory catarrh was present. This type appears to conform more nearly to the variety described by H. Herbert<sup>1</sup> as common in Bombay in the cold and early hot weather, although by no means in all particulars. In one case most particularly studied all examinations were negative except for the presence of a vaguely described intestinal indigestion controlled by strict dieting; no bacterial elements, as in Herbert's cases, were found.

Another variant is the following, one case having been especially investigated. The early stages conformed exactly to type,

but during exacerbations, which were frequent, occurring during a period of several years, at the height of the irritative phenomena numerous small filaments appeared in the form of small gray tags of epithelium, that is, a manifestation of filamentous keratitis. Always there was more relief from intranasal treatment, but final cure was not obtained until a deviated septum was eliminated by a submucous resection; all other etiologic features were eliminated by the usual methods.

Superficial punctate keratitis, herpes corneae febrilis, and dendritic keratitis are clinically allied to one another, and all of them probably neuropathic in origin. Socalled filamentous keratitis is not exactly a clinical entity, but a manifestation in the course of variety of superficial corneal lesions, and therefore easily took origin from the small lesions in the case under consideration. Hence the two types referred to are variants, or, more strictly, there is one variant, that is, a superficial punctate keratitis typical in onset develops as an unusual anomaly, small pit-like ulcers apparently not preceded by characteristic vesicle formation, as in herpes, but by loss of the slightly thickened epithelium over the punctate spots, associated with an iritic involvement without synechiae and proceeding to healing, or as in the second case, developing with each exacerbation filaments (socalled filamentous keratitis). The arguments in favor of the neuropathic origin of these corneal conditions have been often presented, by no one so forcefully as by Verhoeff, both from the histologic and clinic standpoint,<sup>2</sup> and need not be repeated. The toxin probably acts on the cells of the ciliary ganglion. It is significant that in some of these cases, if not in all of them, a history of influenza, antedating the corneal disease by a considerable period of time, weeks, or even, in one of my cases, several months, may be obtained, in other words, they may be a late result of an influenza toxin arriving at the corneal nerve filaments (short postciliary nerves), just as neuritis elsewhere in the body may have a similar origin, and represents a delayed manifestation.

Herpetic keratitis (herpes febrilis corneae) in its various manifestations, that is, either as a superficial ulceration extending in all directions, or as branched and dendritic ulcers, or as stellate lesions, as is well known, frequently accompanies or follows influenza. During the recent widespread epidemics of this disease attention has been called to the fact that these forms of keratitis not uncommonly in course and development almost exactly conformed to those which definitely belong to the neuro-paralytic group. As personally observed, two types were evident.

In the first one, preceded by a moderate congestion or inflammation of the conjunctiva, a central infiltration followed by a depression due to exfoliation of epithelium developed, spread in all directions, until the cornea, except for a margin of 3 or 4 mm was involved; in the periphery secondary foci of infiltration were evident. In the severe cases there was central necrosis; in one case hypopyon. Corneal anesthesia was present, and the intra-ocular tension was diminished; there was severe pain through the trigeminal distribution.

In the second one the first manifestation consisted in a central circle of small dot-like infiltrations, which stained readily and which either gradually disappeared, or coalescence took place and a central ulcer developed with tendency to spread laterally. If vesicle formation preceded the circle of infiltration this stage was not observed. As in the other type, the cornea was insensitive, and the tension (finger test) was diminished.

Evidently the first of these types of keratitis exactly corresponds to the appearance seen after ablation of the Gasserian ganglion, or division of one of its branches, differing only in general conditions in the presence of violent trigeminal neuralgia. It would seem that the causal lesion in such a case is probably in the Gasserian ganglion.

A small white ulcer or infiltrate,  $\frac{1}{2}$  to 1 mm., confined to the epithelium, situated just at or within the corneal margin (usually the upper), not appearing in crops, but almost always in a single manifestation, is not an infrequent corneal lesion in middle-aged or elderly subjects, especially those with a uratic diathesis. A variant form is one which appears not as a small round lesion, but as an oval patch, like a gray flake, slightly elevated, and as before confined to the epithelium. In either instance there are little or no irritative signs, only perhaps a slight flush in the adjacent scleral conjunctiva. The only excuse for making reference to this very ordinary condition is that in a number of cases, seen especially in recent years, the marginal spot (rarely two or three) developed apparently in association with some form of digestive or intestinal disturbance. During the past war many varieties of herpetic keratitis were observed, some undoubtedly due to antityphoid inoculation, many in association with influenza, others coincident with naso-pharyngeal catarrh and types of ethmoiditis (also perhaps of influenzal origin). But in a number of the cases these usual etiologic factors were wanting, and digestive intestinal disturbances, due to faulty diet, or to failure properly to assimilate food, as well as irregularities in

its administration, were apparently the causative factors. In many of these cases the herpetic keratitis developed severe manifestations, and recurrences and crop vesicle formation were common. But the little lesions to which I make reference (now referring to civilian practice) are something like herpetic aphthous stomatitis (not, of course, the parasitic type), and it is not improbable that these single (rarely double or triple) spots may have an origin identical with an aphthous patch, except in the absence of a preceding vesicle. The small round or oval area is exactly like the gray base of a buccal herpetic patch after the vesicle has broken, save only that unlike herpetic stomatitis, only one or two occur, and not a crop of them. These marginal spots disappear promptly if touched with iodine or trichloroacetic acid, they do not relapse in the ordinary sense of that term, but recur at intervals months apart, it may be, and always, it would seem, as part of the symptomatology of a digestive upset. I have one patient, a vigorous outdoor man, who invariably develops a spot of this character after imprudent eating, for example, indulgence in a Welsh rarebit. Another one has a patch of choroiditis of long standing, which occasionally begets a small, fresh lesion at its margin, for which iodids have often been ordered, which, to use an ordinary term, upset his stomach, and usually cause a small gray marginal ulcer to appear.

As is well known, Fuchs has described a rare corneal condition, occurring mainly in old people (usually males), which this distinguished author describes as follows: "It is marked by the presence of yellow, puriform deposits, placed very deeply in the cornea. Sometimes a single, large, usually central, deposit occurs; more often there are several, the size of a pin-head and variously disposed. The deposits are generally surrounded by a grayish, hazy, often punctate, opacity. The condition is associated with a severe iritis, which, indeed, probably constitutes its real starting point. It is also accompanied by hypopyon, deposits on Descemet's membrane and, at times, vitreous opacity. There is great pain. The deposits never break down to form ulcers. Occasionally they undergo resolution, but generally they are transformed into permanent opacities, and in bad cases flattening of the cornea may ensue. Usually but one eye is affected. The disease runs a chronic course, and treatment has very little effect. In some cases syphilis seems to be the cause; in other cases the origin is unknown; but in any event the immediate cause must be a toxin, derived from the inflamed iris and acting on the cornea from behind."

In this connection I desire to report the following case history: A married woman, aged 55, was admitted to the University Hospital, April, 1908, who gave the following history: About twelve years prior to the time when she sought relief from her ocular difficulties, her right eye received a slight injury, having been struck with the wisp of a broom. Following this slight injury, for about a year on different occasions she had recurring attacks of ocular pain and irritation, which it may be inferred consisted in relapsing erosions of the cornea, and during two years prior to admission to the hospital she again had a recurrence of these attacks, with sharp, foreign body sensation in the eye, some redness and brow pain. What exactly were the conditions it is impossible to state, as there was no way in which the record of any examinations made during this period of time could be obtained.

*Previous medical history.* As a child the woman had measles and chicken-pox; in adult life, an attack of typhoid fever, which was complicated, according to her description, with periostitis of the tibia, and at the time, or shortly afterwards, an unusually severe period of keratitis, or at least, of ocular inflammation of some character. She had had for a number of years muscular rheumatism.

*Family history.* Her mother had died in childbirth; the cause of her father's death was unknown; one child was living and well; one child died in infancy. There was no history of tuberculosis or of neoplastic disease. The woman was a hardworking housewife, used tea and coffee in moderation, denied the use of alcohol. There had been no miscarriages.

Examination at the time of her admission to the hospital revealed a certain amount of gastric disturbance and persistent constipation; hemorrhoids were present, and blood appeared in the stools, probably due to them. There was no cough, dyspnea, or palpitation. The menopause had been established for six years and there were no pelvic lesions. She was slightly deaf in each ear. The ocular examination was as follows: Vision—hand movements; the entire sclera was densely injected with special ciliary injection; the iris was thickened but no nodules appeared in it, nor were there any synechiae demonstrable, or at least, none of large size. The pupil, however, failed entirely to respond either to light or to the action of mydriatics. Situated in a zone midway between the margin of the cornea and its center, there was a circle of yellow dots, varying in size from  $\frac{1}{2}$  to 1 mm. and about thirty in number, disposed in a circular manner and

situated deep in the cornea, apparently in its posterior parenchyma. Between and surrounding these dots the cornea was hazy. In the central area of the cornea, directly over the pupil

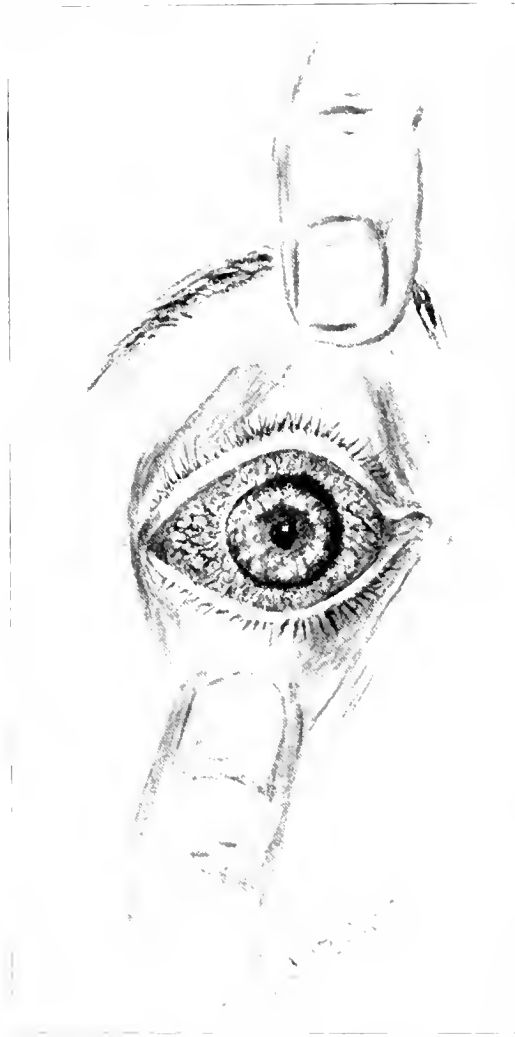


Fig 1 Deeply placed dot-like puriform deposits, many of which were ultimately transformed into permanent opacities.

space and immediately surrounding it, there were no yellow exudates, only a slight haze, but not sufficiently dense to prevent a view of the thickened and infiltrated iris. The eye was intensely

tender and the pain severe. There was no hypopyon. The tension of the eyeball was minus. (Fig. 1.)

An examination of the urine revealed a specific gravity of 1012, an acid reaction, a trace of albumin but no sugar; occasional hyalin casts were present and a few leucocytes, a number of squamous epithelial cells, but no crystals.

The blood count was as follows: Hemoglobin 75 per cent. R. B. C. 4,850,000; W. B. C. 9,800. The Wassermann reaction was negative. A culture made from the surface of the cornea revealed two colonies of *micrococcus albus*, almost certainly a contamination, as subsequent cultures failed to show any specific microorganisms. The treatment consisted in hot compresses, atropin, diamin, holocain, and full doses of salicylates.

There was a very distinct improvement after a considerable period of time, and many of the yellow dots underwent resolution, and the vision when she left the hospital was 3/22, with some corneal haze and some apparently permanent opacities.\*

Whether this case should be classified with the type of keratitis which Fuchs has described as keratitis pustuliformis profunda is uncertain, and yet it is the only case in my experience in which such deep apparently puriform deposits have occurred in the cornea in these circumstances. Syphilis was evidently not a cause; except for the attack of typhoid fever with complicating periostitis and the long history of muscular rheumatism, no etiologic factors were discovered. There were no conspicuous lesions of focal infection, but it is proper to state that the teeth were not X-rayed, nor were the tonsils removed. The constipation yielded to ordinary remedies, and there were no conspicuous signs of intestinal sepsis. What relation, if any, the attacks of what seem to have been relapsing erosion of the cornea had to this condition I am unable to say, but they had occurred originally so long before the lesions here described developed that it is a little difficult to establish a connection between the two conditions, although it is of course not impossible that an infection passed through and disposed itself in this somewhat unusual manner. Fuchs, it will be remembered, in his cases found that there was a decrease in the intensity of the corneal lesions from behind forward, and he satisfied himself that the toxin, whatever it may have been, was derived from an inflamed iris and acted from

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\*Since this paper was presented the patient has been examined. The eye is white and quiet, but there is a circle of white opacities within the cornea.

the rear. Certainly in this case the iris was thickened, infiltrated and unresponsive to mydriatics, and the ciliary injection was suggestive of a deeper involvement. It was not possible to see the eyeground with distinctness, and the vitreous changes which Fuchs has described, if they were present, were not detected.

An unusual development of the lesions in a case of deep keratitis was noted in a man, aged 43, who came for treatment to my clinic in the University Hospital February 24, 1908. The history is as follows:

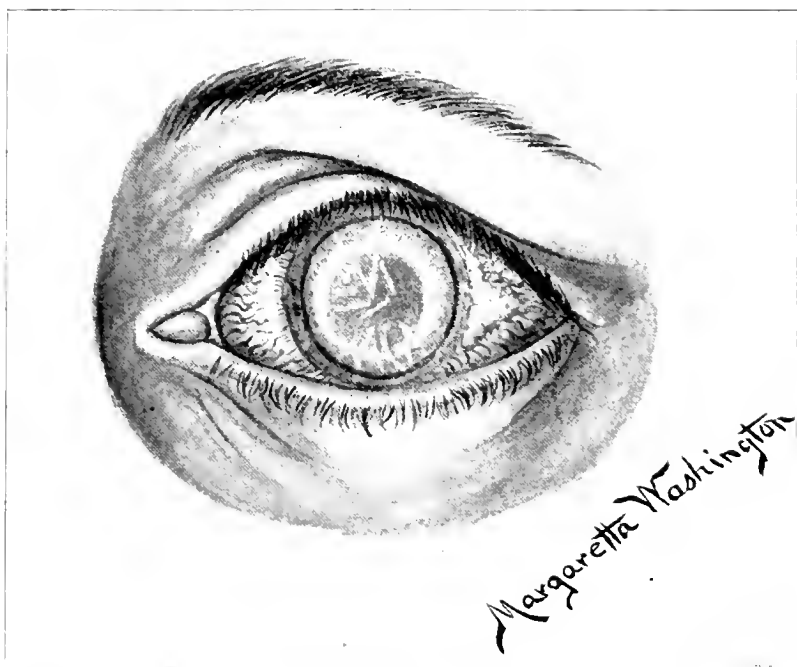


Fig. 2 Deep keratitis; lines of infiltration due to wrinkling of Bowman's membrane.

The left eye of the patient, an ordinary laborer, "became sore" about three weeks prior to his admission. There was no evidence nor history of injury. The vision of the affected eye was hand movements; the uncorrected vision of the right eye 6/22; its retinal vessels showed the early signs of angiosclerosis; otherwise no changes. He probably indulged too freely in the use of alcohol. He was not a syphilitic subject. The Medical Dispensary reported: "Myocarditis, persistent indigestion, ptosis of the liver and stomach; some atrophy of the liver; no albumin, casts or sugar; moderate indicanuria."



Ocular examination revealed pronounced conjunctival and pericorneal injection; iris somewhat discolored, but no iritis; a central disc of corneal infiltration, with a few delicate lines of infiltration apparently rather deeply placed, the overlying epithelium being slightly roughened; marked tenderness and ocular pain. At the end of eighteen days, atropin mydriasis having been maintained, and internally laxatives and salicylates, there was no material improvement; in fact, the central infiltration, if anything, had grown denser, the corneal epithelium was irregularly roughened ("orange-skin cornea"), and the white lines between the infiltrate and the corneal surface had grown more conspicuous and had extended to the periphery.

Approximately seven weeks after the patient's first examination, and ten weeks after the first manifestation of inflammation, the lesions existed which are depicted in the accompanying diagram (Fig. 2). Coarse bulbar and a rim of pericorneal injection, beginning vascularization of the corneal margin, a zone of dense parenchymatous infiltration midway between the corneal margin and its center, and a number of linear infiltrations, extending above and below, from near the center of the cornea to the periphery; general haze of the epithelium; iris invisible; no staining reaction from fluorescein. The linear infiltrations (keratitis with geometric figures) were evidently not due to folds in Descemet's membrane, nor to rupture of the posterior elastic membrane; they differed in appearance from the straight lines often observed diverging from the margin of an infected corneal ulcer through the parenchyma of the cornea, caused probably by plications in Descemet's membrane, or by cellular infiltration. From their position they appeared to be due to wrinkling of Bowman's membrane overlying a linear infiltration in the substantia propria above the deeper circular lesion.

Naturally, they have nothing in common with the superficial linear keratitis of Spicer and Greeves, or the "alphabet keratitis" of Haab, if these two conditions are not identical, save only in the disposition of the lines in forms roughly resembling letters (a V, an M, an A), and in their position, in that they appeared to be due to ridges formed by elevation of Bowman's membrane with underlying infiltration.

The patient attended the clinic irregularly for a time, with only slight improvement; then disappeared, to return at the end of a year with an eye in a condition exactly like that shown in the diagram, but with all symptoms more marked than formerly. His later history cannot be given, as he deserted the service and

could not be traced. The keratitis may have arisen in connection with intestinal sepsis, the only etiologic factor discovered, although the general examinations were not nearly as complete as they should have been, owing in part to the difficulty of controlling the attendance of the patient. The somewhat uncommon disposition and position of the lines of infiltration constitute the only one exceptional feature of the corneal manifestations.

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#### DISCUSSION

DR. EDW. JACKSON, Denver, Colo. : It seems to me the only discussion of this paper which is possible is to point out its essential character, and to emphasize that, which must have struck many of us while listening. First, it is a presentation to the hearer straight—not read; not something to be put upon the printed page, but adapted to the hearer. It is a presentation that uses the facts of pathology as they should be used in a meeting, not to obscure or confuse the clinical picture, but to explain it; and to connect the various phenomena into a united whole. Perhaps that is more needed with reference to corneal diseases than in almost any other department of eye diseases.

Of corneal disease, and particularly of corneal inflammations, there has been a great deal of describing separate clinical forms, sometimes by one name and then by some one else by a second name. The last instance described by Haab and Spicer under different names, probably is the same condition. There is a large amount of material in chaotic condition in the literature, and in our minds in regard to the corneal inflammations. This paper tends to bring them into order, into their proper relation to each other, and in that way it is valuable.

The first group of cases, to my mind, are based on the neuropathic element in all of these different forms. Not only the regular form, of anterior punctate keratitis, but the variant forms. I think the element of the nerve enters here in the distribution of the lesion and in the connection with the preceding influenza. They all illustrate the nerve paths as the way in which the morbid influence produces the pathologic changes.

With reference to deep pustular keratitis of Fuchs, I think the underlying pathology would be better understood now than when Fuchs gave his original description; through the increasing emphasis we are learning to place on focal infection, and the better understanding of what this is and what it implies, both in what is to be considered as the original manifestation and the very great likelihood that lesions will be found elsewhere that depend essentially upon it. For instance, "chronic rheumatism" was mentioned as one of the prominent diseases in the history. If we take the knowledge we have now of focal infections and the influence on the eye, and combine

that with what we know of the response of the cornea to such processes, we get the elements of the extremely chronic course and late appearance. This connection of isolated clinical forms with each other and with the facts of pathology, physiology and anatomy of the cornea, is especially important just now. We must each go back to anatomy of the cornea, the general principles of pathology, and form to some extent our own grouping, if we are to master this developing literature.

DR. H. B. YOUNG, Burlington, Ia.: Some of you who were at the Chicago meeting may remember a case of superficial keratitis I exhibited on which there was a difference of opinion as to the actual pathology. Dr. Lamb will remember it was discussed as to whether it was an unusual form of lime deposit, which view I could not accept. Others said it was an unusual form of herpetic keratitis. It was a superficial round affair a little to the temporal side. The man, a well nourished farmer of 45 years, complained of intense pain in the day but none at night. Was even willing to sacrifice the eye. Saw Dr. Gifford later and he must have had thirty or forty ophthalmologists look at it; but there was no definite conclusion as to the actual type of keratitis. Various methods of treatment were suggested, and out of the suggestions I at last adopted superficial scraping and application of the cautery, but made it worse. It had little elevations of the epithelium like small blebs which would stain. After a time I discovered there was a peculiar increase in the size. It increased by the formation of little dots around the edge. It looked more to me like the development of *tinca circinata* than anything else. The application of acetic acid followed by a collyrium of quinin hydrochlor, gave relief, and at the end of a year the infiltrated area had become so thin I could see the pupillary margin through it. About two months ago he came in and there was deeper infection. I made an application with the thermaphore and got some relief. Have not seen him since, but I wish to ask if it is possible to incorporate the spore as on the skin.

DR. C. W. HAWLEY, Chicago: When I was listening to Dr. Jackson I realized that his mental punch was very much like Dempsey's. Most anything up in front of Dempsey gets a black eye and there were a good many black eyes in front of Jackson, but I did not realize he hit our friend Beck so hard, and seriously bothered Dr. de Schweinitz' conscience. But I realize we are all a little too long with our talk. The subject of this paper is very interesting. I have had a number of cases that were like his first. The source of their origin is undoubtedly some toxin from some other portion of the body. And why not? The nerves that enter the cornea are very much exposed and the toxins are just as likely to strike those exposed in the cornea as in any other portion of the body, for instance, in the skin. I remember one interesting case that at the time was new in my practice and I could not classify it. It had been treated a number of years by a competent man in Chicago, but finally fell into my hands and I was a little more successful in treating it than he was. I went upon the theory that it was rheumatic and strongly advised my patient for rheumatic treatment heroically. I got no

results. About the same time I had a very unfortunate experience myself and began to learn something about focal infection and auto-intoxication, and the next attack I put my entire effort on treating the lower bowel with hot water enemas, and the last ten years she has had no attacks. The keratitis she had recurring once or twice a year, for twenty years, and thanks to the treatment for the auto-intoxication she has been entirely well since. I think if we will look for some such toxin attacking the exposed nerves in the cornea we will get results where we have been disappointed.

DR. F. P. CALHOUN, Atlanta, Ga: Under the discussion of unusual forms of keratitis, I should like to mention a type commonly seen in our clinic among adult negro patients, where Wasserman's are commonly and strongly positive and where infections are frequently found in the teeth, tonsils and intestinal tract. The lesion is in the substantia propria and is characterized by linear and small snowflake like opacities in the central area with very little pericorneal injection.

Inasmuch as these cases tolerate large doses of potassium iodid and mercury, and the opacities clear up in a remarkably short time, that is, in from three to five weeks, it is our impression that they may be classified as an atypical interstitial keratitis which is a late manifestation of acquired syphilis. Keratitis punctata profunda of Fuchs is an allied type.

DR. G. E. DE SCHWEINITZ (closing the discussion): An interesting observation made by Verhoeff is that fluorescein stains the "spots" in punctate superficial keratitis, even though the epithelium is apparently not broken or exfoliated over them. This he considers as a somewhat characteristic reactions in corneal lesions of the neuropathic group. I would call attention to the value of holocain in the treatment of these corneal lesions. Answering Dr. Calhoun's question, I think the lines in the patient's cornea, which resembled somewhat letters of the alphabet, were due to infiltrations beneath Bowman's membrane, which was folded, and not to a situation of such infiltrates in Descemet's membrane. The corneal microscope seemed definitely to show that this was their situation. Fuchs believes that the deep infiltrates in keratitis pustuliformis profunda follow from an infection which begins in the iris, and passes from behind forward. This, I think, was the case in the instance which I have recorded. Search for focal infections was made in the cases reported, but was not as thorough as was desirable in the woman with pustuliformis keratitis.

# THE PATHOLOGY AND TREATMENT OF VINCENT'S INFECTION OF THE MOUTH AND THROAT

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Vincent's infection, so-called, is an acute, subacute or sometimes chronic inflammation characterized by the formation of a false or pseudomembrane, and in the more severe cases by ulceration and localized gangrene. It is caused by, or at least always associated with, the presence of a large number of fusiform bacilli and spirilla. The disease process is usually localized, and may involve the tonsils, uvula, palate, gums, cheeks, tongue and lips. Cases have been reported, however, in which the larynx, trachea, lungs, nose and skin have been involved by extension of the infection.

All who have followed the current medical literature during the past few years are familiar with the disease. My object in this report is to give a rather detailed study of thirty cases with special reference to their pathology and treatment.

In the literature the disease has many names—ulcerative angina and stomatitis; pharyngitis ulcerosa; angina diphtheroides; angina exudativa ulcerosa; Vincent's angina; ulceromembranous angina and stomatitis; angina chancreforme. All of these terms relate to the same morbid process. In reviewing the literature, one is struck by the widespread distribution of the disease. In his later contribution, 1905, Vincent states that of all forms of angina in adults, his disease constitutes 2.26 per cent. It has been described in practically every country. In the United States only a few cases were reported until the outbreak of the recent war. During the war both in this country and abroad mild epidemics were reported in practically all camps and military centers. Among the British and French troops, according to Bouty, Vincent's angina constituted 23 per cent of all throat infections.

## I. ETIOLOGY.

*A. Climate and season.* The disease occurs in practically every climate. It was first described by Russian and French clinicians, but since the original description cases have been

reported in every country. In my cases, which were reported in Minneapolis, Camp Dodge, Iowa, and Washington, D. C., all were American except two. One was Norwegian and one Russian. The Americans were from all climates of the United States. The incidence of the disease has no relation to the season.

*B. Age and sex.* The most of the cases reported in the literature has been in children from two to ten years of age, and in adults between eighteen and thirty-five years of age. Blackwood reports nine cases in children from two to ten years. Bruce ten cases, most of which were children. Weaver and Tunnicliff eleven cases, all in children. The more recent writers, especially since the beginning of the war, all report cases in young adults (soldiers). Campbell and Dyas reported a study of one hundred and twenty-nine cases seen during the course of four months, all of which were in soldiers in the Canadian army. Males are much more frequently affected than females. This, of course, is easily explained during mobilization because of contact infections. In my thirty cases, three were in females and twenty-seven in males. They were all adults varying in age from eighteen to forty-two.

*C. Predisposing causes.* Many factors are named as predisposing causes, such as smoking or chewing tobacco; the use of alcohol; dentition; dental caries; anemia, and debility from acute infection, such as scarlatina, measles and typhoid. It has also been reported as complicating tuberculosis, syphilis and diphtheria. Of all the predisposing causes mentioned, the one which was most important in my series was dental caries. Carious teeth and pyorrhea existed in practically every case.

*D. Bacteriology.* Although the infection is usually referred to as Vincent's angina, it was first described by Raufus in 1893 in cases of ulcerative angina. Plaut in 1894 reported five similar cases. Two years later (1896) Vincent gave a detailed account of forty-seven cases of hospital gangrene caused by a long vacuolated bacillus associated with a spirillum. In 1897 Bernheim reported thirty cases of angina and stomatitis and in 1898 Vincent reported fourteen cases of angina, caused by these organisms. All of these early authors described in smears from the membranes and ulcers, long fusiform or S-shaped bacilli, vacuolated, with pointed or tapering ends, and practically always associated with a more faintly-staining spirillum. Early attempts to cultivate the

organisms were unsuccessful. Vincent was successful, now ever, in transmitting the infection to animals by inoculation.

In 1905 Weaver and Tunncliff succeeded in cultivating the fusiform bacillus in mixed and pure cultures, and by inoculation of pure cultures were able to produce ulcers locally in animals. The spirilla were cultivated only in mixed cultures. Both organisms are obligatory anaerobes. From their studies at that time Weaver and Tunncliff concluded that the fusiform bacillus and spirillum were distinct organisms and grew only in symbiosis. In more recent investigations, however, by Tunncliff and others it has been definitely proven that the spirillum is developed from the bacillus and represents a more highly differentiated form of the same organism.

While Koch's laws have not entirely been fulfilled, certainly the work of Weaver and Tunncliff strengthens materially our conception that these organisms are the causative agents in this characteristic pathologic process.

In the thirty cases here reported, smears from the lesions in the throat and gums invariably showed large numbers of fusiform bacilli and spirilla. They were always present in numbers far exceeding any other variety of organisms. This was particularly true in smears taken from cases when they were seen for the first time and had had little or no treatment. Although cases have been reported in which the bacillus alone is found, the spirillum was constantly present in all of my cases. The organisms stain readily with any of the ordinary anilin dyes, but the spirilla show clearest with carbol-fuschin. The bacilli are long, slender rods with pointed or tapering ends and somewhat larger in the middle. They are usually curved or half-moon shaped and may occasionally be S-shaped. They vary in length from 6 to 12 microns. While usually scattered throughout the preparation, they sometimes occur in pairs, or in chains, end to end, or in clusters radially arranged. In the larger forms it is not uncommon to see portions which stain less intensely, making the organism appear vacuolated. They do not form spores and usually decolorize by Gram's method.

The spirilla, often called spirochetes, are long and slender and always more faintly stained than the bacilli. They frequently show from three to six turns, but may appear straight and threadlike. They, too, decolorize by Gram's stain. In dark field preparations the spirilla are actively motile. The bacilli are slightly motile, but lose their motility after

a few minutes. When the fusiform bacillus was first described it was mistaken for the Klebs-Löffler bacillus because of its morphologic similarity. Most writers report the presence of fusiform bacilli and spirilla in from 3 to 5 per cent of cases of diphtheria. The recent figures of Emrys-Roberts (1917) of 60 per cent is far too high.

## II. SYMPTOMS.

The symptoms are directly proportional to the extent and severity of the lesions. In some of the milder forms there may be no symptoms, the infection being found accidentally in the course of a general examination. In the routine examination of thirteen normal throats Gross found the organisms in the tonsils of eleven. From this and from similar studies it appears evident that the organisms of Vincent, like those of diphtheria and pneumonia, may be normal inhabitants of the mouth, and become pathogenic only with increased virulence of the organisms or lowered resistance of the host. The incubation period is unknown, but from the report of Shea in the American forces abroad, it is thought to be about fourteen days. In the acute, moderately severe, or severe form, the patient complains of a chilliness, slight malaise, headache, tenderness and bleeding of the gums, dysphasia, tenderness and stiffness of the neck. The fever varies from 99.5 to 102 and usually drops on the second or third day to normal. In all cases there is fetid breath and bad taste in the month. Bowman states "the most serious constitutional symptom and one always present when the teeth and gums are affected is severe depression." This condition was present in only one of my cases.

## III. PATHOLOGY.

*A. Gross.* Regardless of the location of the lesions, the stages of the gross pathology are the same. The progress of the disease can be divided into three stages. First, a period of congestion and edema; secondly, the formation of a false membrane. The disease when seen at this stage is often called the diphtheroid type. The membrane is usually dirty-white or yellowish-white, slimy or greasy in appearance, and peels off quite readily, leaving a raw, bleeding surface. The membrane when removed quickly reforms. The third period is one of ulceration, which is usually quite deep and may even progress to a stage of true gangrene with destruction of the



entire gum, tonsil, uvula, soft palate, or even hard palate as described recently in a case by Barker and Miller. Cases have been reported in which the epiglottis, the thyroid cartilage and vocal cords have been destroyed. In the cases here reported all but two showed ulceration. These two cases which had reached only the second stage, i. e., the period of membrane formation, developed in patients who were being treated for other nose and throat trouble and consequently were caught early and cured before they reached the ulceration period. The remaining twenty-eight cases all showed ulceration either of the gums or tonsils, or both, and in two cases the soft palate also was involved. In three cases both tonsils were affected. Early in the disease all cases had tender, swollen submaxillary or cervical lymph nodes.

I will not go into further detail in describing the location of the lesions, but do want to emphasize the point that in practically every case there was a gingivitis or a history of tender, bleeding gums before the onset of the throat involvement. The ulcerations are very characteristic. They are usually quite deep, have sharp, punched-out margins or undermined edges. There is only a very small areola in the tissue immediately surrounding the ulcer and little or no induration. When the membrane is removed and the ulcer cavity cleaned of exudate, its base presents a roughened granulating surface which bleeds freely.

*Laboratory findings.* Urinalysis is negative in patients who are otherwise healthy. Wassermann is always negative unless the disease is complicated by syphilis. Taylor and McKinstry in fifty-five cases found the Wassermann positive in two, but proved that these had latent syphilis. In one of my cases the Wassermann was positive, but the patient had other signs of syphilis. The blood shows invariably a polymorphonuclear leucocytosis ranging from eight to twelve thousand.

*B. Microscopic.* Microscopically the picture of Vincent's angina is quite characteristic. Sections cut through the ulcerations show large areas of necrosis, which are limited or bound by a zone of tissue containing a great number of polymorphonuclear neutrophils. Plasma cells are present in considerable numbers. Two of the cases showed numerous eosinophiles scattered throughout the ulcer walls. There is a marked congestion of all the surrounding tissue. Most of the crypts are filled with exudate containing lymphocytes, eosinophiles, degenerated epithelium and fibrin. Thin paraffin

sections stained for bacteria show the fusiform bacilli and spirilla clumped in large masses over the necrotic tissue, and scattered diffusely throughout the living tissue at the base of the ulceration.

These observations for the microscopic pathology were made from five cases in which the tonsils were removed during the period of active ulceration. One was a private patient who developed symptoms three days prior to the time when I first saw him. He had a temperature of 99.8, headache, dysphasia, tender spongy bleeding gums, fetid odor to the breath, and slight general malaise. Examination showed an ulceration on the right tonsil about the size of a dime and an ulceration on the left tonsil about the size of a split pea. Three days later the tonsils were removed under a local anæsthetic. He made an unusually good recovery, which differed in no way from the normal.

Another case was one which was being cared for by a physician in one of the small towns of the state. The diagnosis was not made until the tonsils were sectioned and examined microscopically. With the specimens which the physician sent in to the Department of Pathology for diagnosis was a letter stating that the clinical diagnosis was tuberculosis. Very little history was obtainable except that the disease was acute, accompanied by fever and swollen cervical glands and that the patient was a soldier recently discharged from the service. Grossly, one tonsil showed a large deep ulcer on its mesial surface. Inquiry revealed that smears had not been examined and that the patient made a good recovery from his tonsillectomy.

Two other cases, both showing deep ulceration of the tonsils, were operated after three or four days of treatment. The microscopic pathology was very similar to that of the cases described above. On the third day, postoperative, one of the patients developed an acute gingivitis, involving the entire gingiva of both the upper and lower jaws. Smears made from the gum margins showed fusiform bacilli and spirilla predominating.

The fifth case is extremely interesting, as the diagnosis of Vincent's was not made nor suspected until the patient developed an acute general postoperative gingivitis similar to one of the cases previously described. When the tonsils were examined microscopically the ulcerations were found confined to the cryptal surfaces; none being found on the exposed palatal surface of the tonsils.

## IV. DIAGNOSIS.

The diagnosis of Vincent's infection is, as a rule, not difficult. As in any other infection, the whole evidence must be weighed: The onset, the symptoms, the leucocytes, the negative Wassermann and the gross appearance of the lesions together with the examination of smears and cultures. While the bacteriologic examination of the smear usually suffices, such is not always the case, for there may be a double infection, such as Vincent's with diphtheria or Vincent's with syphilis. In all severe forms of angina, one should make smears and cultures and a Wassermann if necessary.

*Diphtheria.* In diphtheria the constitutional symptoms are usually greater. The patient has more prostration and higher temperature. In diphtheria there is not a tendency to deep ulceration and usually no accompanying gingivitis. In cases of doubt, the twenty-four hour culture may be the only means of correct diagnosis, especially in cases of double infection.

*Syphilis.* In the purely syphilitic anginas there are few or no fusiform bacilli or spirilla. The Wassermann, of course, is positive. In cases of combined infection in which the Vincent's infection is secondary the lesions do not respond to ordinary treatment.

*Tuberculosis.* Tuberculosis involving the tonsil and palate may be differentiated from Vincent's angina by the fact that the ulceration in tuberculosis is very superficial and tends to spread serpigiously. It has much more induration and less exudate than any other form of angina. I saw one case in consultation in which the diagnosis of Vincent's angina had been made by the doctor because of the presence of fusiform bacilli and spirilla in the smears and because of a negative Wassermann. I removed a portion of the uvula for examination and it proved to be tuberculosis (lupus).

*Acute follicular tonsillitis.* In acute tonsillitis the infection is practically always bilateral. There is absence of ulceration and only slight tendency to definite membrane formation. The temperature is often higher and the constitutional symptoms greater than is found in Vincent's infection.

## V. COURSE AND PROGRESS.

In most cases the disease is self-limiting, running a benign course lasting from a few days to a few weeks. Recurrences are extremely common, especially in cases in which the primary gingival infection is not adequately treated. In a few

instances virulent cases have been reported from extension of the infection to the larynx, trachea and lungs. Involvement of the prepuce and vulva have been reported as secondary infections from sexual perversion. The average duration of my cases was about six days. The shortest duration was three days and the longest twenty-one days. The duration of some of the cases was unnecessarily prolonged because of experimentation in therapy. In the cases which were adequately treated the number of organisms rapidly diminished in the daily smears examined. All cases terminated in recovery, but eight had recurrences. These recurrences were in early cases which did not have dental treatment or tonsillectomy.

#### VI. TREATMENT.

Theoretically, the ideal treatment of Vincent's infection would be a flooding of the tissues with oxygen and a wide exposure of the lesions to the air, as is done with tetanus and other anaerobic infections. I have seen no report of this method in the literature, possibly because of the success which has followed other therapeutic agents or because of the fact that the disease is self-limiting and usually not serious. Most all writers do, however, advocate removing the false membrane and cleaning away the exudate before applying any of the numerous therapeutic agents recommended. Vincent originally treated his cases successfully with tinctur of iodine applied locally. Since that time many drugs have been recommended both locally and internally. Of the agents for local application may be mentioned sodium hypochlorit; methylen blue; liquor potassii arsenitis; silver nitrat; hydrogen peroxid; phenol, pure or in conjunction with other drugs; wine of ipecacuanha; potassium permanganat; trichloroacetic acid; chromic acid; arspnenamin, etc. Internally arspnenamin, potassium chlorat and potassium iodid are recommended.

Vincent's angina is purely a local infection and seldom requires more than local treatment, except the usual catharsis and rest in bed if there is fever. In my cases, I tried locally trichloroacetic acid, chromic acid, tinctur of iodine, arspnenamin, sodium cacodylat and silver nitrat. The most rapid improvement came with the use of silver nitrat in 25 or 50 per cent solution, according to the severity of the lesions. The poorest results followed the local use of arsenical preparations. Preceding all the applications the membrane was removed and the ulcerations cleaned with hydrogen peroxid, or Dobell's solution. Arspnenamin was given intravenously

in quite a few of the early cases without beneficial results. Many of the cases treated locally with arsenical preparations showed temporary improvement, but relapsed again in spite of frequent treatment.

In the cases with very deep ulceration, the weaker solution (25 per cent) of silver was used and later in these cases and in the milder cases 50 per cent solution was used. It was very remarkable to see the rapid improvement which developed in the twenty-four hours following the first application. Practically all of the subjective symptoms were gone with the first two or three treatments. After the instigation of vigorous local treatment with silver the ulcerations heal as quickly as nature can repair them, usually about six to eight days. Shea in his recent report advocates cauterization of the ulcer with any of the usual caustics followed by arsphenamin both locally and intravenously. Dr. H. F. Tangeman of Cincinnati, who served with Base Hospital 208 in France, says his best results were obtained with 50 per cent aqueous solution of chromic acid. He found, as many others reported, that local applications of arsenic in any form was of little or no value. Many of his cases also seemed to resist strong solutions of silver nitrat. In the general treatment he advocates large amounts of orange juice. Many of his severe cases recovered in the course of five or six days with no other treatment than the ordinary army diet to which had been added at least eight oranges daily.

In the treatment of these cases it is not of so much importance what medication is employed locally. Whether chromic acid, arsenic or silver nitrat is used matters very little so long as symptoms are relieved.

Silver nitrat served better than the other caustics in my cases. After the symptoms have subsided and the ulcerations are healed, or healing, the necessary surgical treatment should be done to hasten healing and to prevent recurrences. It is best to work in conjunction with a competent dentist. Tartar deposits and carious teeth should be removed as well as the hypertrophied or infected tonsils. Lastly, the patient should be instructed in the methods of oral hygiene.

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#### DISCUSSION

DR. R. A. BARLOW, Rochester, Minn.: Dr. Camp's paper on Vincent's infection is a very timely one and I think he has covered the ground quite completely. These cases are becoming more numerous both in private practice and in clinics, and the apparent epidemics of Vincent's infection in the army has stimulated considerable investigation and very valuable statistics. As Dr. Camp has pointed out the spiral organism and fusiform bacillus are always found in abundance and they have been regarded as the etiology of the ulceration. There are some, however, who feel that the spiral organisms are secondary rather than primary. It is a well known fact that we find the fusiform bacilli in sloughing malignancies in the throat. I have in mind a recent case of lymphosarcoma which came under our observation recently and from which slides were made demonstrating myriads of the spirilla. The theory has been advanced that this ulceration is simply an oral manifestation of some general disturbances, but as yet nothing has been proved. The treatment which has been found to be most satisfactory in our hands has been the local application of 50 per cent silver nitrat, or 5 per cent chromic acid, and some have responded more promptly to arsenical preparations. The disease is a problem of diagnosis rather than of treatment. We all see cases which have been catalogued as diphtheria which eventually prove to be Vincent's infection. The greatest difficulty in

diagnosis lies in the exclusion of lues and diphtheria. It has been our experience at the Mayo Clinic to find Vincent's infection in clean mouths quite as frequently as in dirty mouths and it is our belief that trauma or some marked disturbances, change of environment, etc. have really a great influence in lighting up the disease. We shall probably have a more definite knowledge of Vincent's infection in the near future, as considerable investigation is now being carried on in various institutions and clinics.

DR. JNO. J. SHEA, Memphis, Tenn.: I wish to take issue with Dr. Camp in several details of the disease. In the first place we saw the cases during an epidemic and were able to follow them for months thereafter and it is our belief that the lesions seen in the mouth are of primary nature and that the future will show secondaries. Nolf (Arch. Med., Belgium, Sept., 1917) claimed that some of their cases developed an odd rash that he considered as possible secondaries. Aptly Vincent's has been called the "Fourth Venereal Disease" and we were able to isolate the same organisms from one case from both the tonsils and rectal condylomata. The position of the lesion is of value in forming a diagnosis as there are several points of selection due to these areas being of an anaerobic nature. The first is the flap so often seen over the partially erupted wisdom tooth, and the second is the superior crypt of the tonsil or the recess under the plica. In these regions the bacteria can hide away from the air and thrive, burrowing their way deeper into the tissue until soon they have undermined a large surface area, producing a slough. Local treatment is sufficient for the mild cases or to clear up temporarily the more severe, but internal administration of arsenic and surgical removal of the tonsils and cleaner dental appliances are necessary for permanent cure.

DR. F. V. OVERMAN, Indianapolis: In the cases of Vincent's Angina I have seen, I should say 90% have had mouths in good condition. Most of these patients have the regular care of the prophylactic dentist. I have never successfully treated Vincent's Angina with silver nitrat, but have had better and quicker results by using 15% solution of copper sulphat. Have found that usually within twenty-four hours after the first application there is marked improvement.

DR. J. W. CARMACK, Indianapolis: I had the privilege of seeing a number of these cases during the war, and we found, as did the last speaker, that many were not complicated by inflammation of the gums. We had quite a large percentage of this trouble among the officers, who ordinarily had cleaner mouths than the average enlisted soldier. I believe, however, that infection in any part of the mouth or throat predisposes to the Vincent's infection.

I want to second the author's use of silver nitrat. We had best results in acute cases with its use. We did not use higher than 20% silver.

I want to emphasize the probability of Vincent's carriers by a short report of two cases, one of which was also a diphtheria carrier.

A young lady of 21 years had a peculiar sore throat at 5 years of age, with a chronic irritation since. Examination microscopically showed Vincent's and diphtheria. Since tonsillectomy, with antitoxin

given at the time, the diphtheria bacilli have disappeared. Local treatments and three doses of neosalvarsan have failed to get rid of the Vincent's infection in the lingual tonsil.

The second, a man 24, had a mild sore throat for seven years, without any acute tonsil inflammation. Examination of surface culture and of tonsil after removal, showed Vincent's infection.

DR. A. A. HAYDEN, Chicago: I see a fairly good number of these cases at the orphan asylum that do not differ in the main from those recited. One case I saw recurrently in private practice. This growth always starts in her right tonsil and she will have one or two attacks of this every year. I have been treating with trichloroacetic acid and silver nitrat for some time, but the last attack I used 5% mercury with a much more rapid recession of the acute swelling etc. and less pain. I agree it is not always the dirty mouth that harbors this, but I believe it is less likely to occur in a clean mouth.

DR. T. E. CARMODY, Denver: One thing to be remembered is that the flap over the third molar is frequently found as the point of infection. Then we can't say they are clean mouths. They are all dirty mouths, especially if they have a bridge that is not removable.

Permanganat of potash is what I use at the base of the ulcerated area. I have used salvarsan etc., locally and generally, but find the permanganat cures more cases. Silver nitrat also cures many cases. You may have to resort to many drugs, as no drug will cure all cases.

DR. W. HAUGHEY, Battle Creek: I second Dr. Shea's remarks. I saw a great many of these cases in France and I feel that the dirty mouth had comparatively little to do with it. The French soldiers had dirty mouths and bad teeth, and we found just as many cases in the American boys. We had an epidemic, as related, and a good many had recurrence until we began to use salvarsan locally. In this country I have had no success as I had in France with salvarsan. We have to alternate it with nitrat of silver.

DR. W. E. CAMP (closing discussion): I wish to thank those who have been so kind to discuss my paper. It is unfortunate that owing to the lateness of the hour we haven't more time. Personally, I have not seen as many cases as did the men in France, but all of my cases, and some of them very severe and extensive, responded to treatment with silver nitrat. In the treatment of my cases, I experimented with zinc, arsenic, etc., but the disease went on until finally it was necessary to use silver nitrat. I think the mouth with extensive dental bridge work, which cannot be removed and cleaned after eating, and the mouth with flaps of tissue over partially erupted teeth is a "dirty" mouth, whether it is found in a General or a Private. When we clean up the teeth and advise the patients in methods of oral hygiene, the incidence of Vincent's infection is reduced.

I cannot agree with Dr. Shea that Vincent's infection should be considered a "fourth venereal disease." It is not a systemic disease, but purely local. The organism, being anaerobic, could hardly be expected to thrive in the blood stream. It is true, however, that infection of the genitals occurs, but it is infrequent and usually secondary.



TRANSACTIONS  
OF THE  
TWENTY-FIFTH ANNUAL MEETING

OF THE  
  
American  
Academy of Ophthalmology  
and Oto-Laryngology

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OPHTHALMOLOGICAL DIVISION



## MINOR PALPEBRAL AND CONJUNCTIVAL AFFECTIONS ASSOCIATED WITH REFRACTIVE AND MUSCULAR ERRORS

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The major part of the work of any ophthalmic practitioner lies in the fields of refraction and motor anomalies of the eye: probably from 60% to 90% of all who consult us do so because of symptoms arising from uncorrected ametropia or imbalance of the ocular muscles. It goes without saying that each one of us will endeavor, pain-takingly, to place upon every patient that particular pair of spectacles which will aid the eyes to perform the exacting tasks demanded by our complex civilization, and induce in the patient a sense of general well-being and unconsciousness of his ocular apparatus. While the principles underlying the tests are universally understood, methods vary, and perhaps, rightly so. "All roads lead to Rome" and equally exact and satisfactory results may be attained by different methods of procedure, adapted to the training and personality of the examiner.

Let us assume, then, that glasses have been prescribed based on a knowledge of the static and dynamic refraction, a determination of the power of accommodation, a prolonged reading test and an estimation and correction (if necessary) of any muscular anomaly (tests being made of the balance for far and near). The routine will include a test of the pupillary reactions, an ophthalmoscopic examination and often a mapping of the visual fields. We should inquire into the occupation of the patient and secure some general conception, at least, of his previous state of health and present physical condition.

Such is the routine which, I presume, most of us follow in the ordinary patient presenting himself with symptoms of asthenopia. We may, in addition, *casually* inspect the lids, ciliary margins, conjunctiva, and cornea, and, failing to find any deviations from the normal proceed on the assumption that all the patient needs is a properly fitted pair of glasses. Now it is to this "casual" inspection that I venture to raise an objection. Such an inspection often fails to disclose certain minor changes in the lids, conjunctiva, and cornea which may be contributory to the discom-

fort of the patient; may, indeed, be the sole cause of his complaints. Symptoms arising from these minor disorders—burning, smarting, itching, stillicidium, foreign body sensation, ocular pain, early fatigue in use, etc.—closely resemble the symptoms of accommodative and muscular asthenopia. Careful correction of the refraction and any associated muscular trouble must be supplemented by equally careful correction of any conjunctival, corneal, or palpebral disorder. Not every patient with low hyperopia or hyperopic astigmatism requires glasses. Sometimes, the symptoms in such patients are due to temporary accommodative weakness incident to recent debilitating illness; they may just as well depend solely on local troubles in the lids, conjunctiva or cornea.

We are all familiar with the conjunctival and slight ciliary congestion, the sensitiveness to light, the epiphora on manipulation, the overred palpebral margins, which so often occur in the ametropic eye and which disappear when the proper correction is applied. It is not these conditions, so obviously dependent on ametropia, and wholly correctible by glasses, to which I wish to draw your attention. I desire, rather, to discuss certain other abnormalities which, in my opinion, should always be sought for, and if found, removed, prior to, or immediately following the refraction test.

As some of these changes are very minute, simple inspection, without magnification, may be insufficient to bring them to light. It is now my invariable practice to inspect the lids and anterior segment of the globe with the Zeiss binocular magnifier, going over in order the skin of the lids, the cilia, the intermarginal space, the caruncle, the puncta, the outer angle, the bulbar and palpebral conjunctiva, the upper and lower cul-de-sacs and the cornea. Such a minute inspection may seem superfluous in patients whose complaints are *apparently* based solely on their refractive error. Often, indeed, nothing out of the way is found. There is, however, a surprisingly large number who present minor pathologic conditions.

#### *Disorders of the Meibomian Ducts and Glands.*

Normally, the ducts of the Meibomian glands can be seen through the conjunctiva as narrow white lines running vertically to the palpebral margin. Either by reason of increased secretion or by partial blocking of the orifices in the lid margin, these ducts become dilated and appear as wider lines. Not rarely a large number of these can be observed in the tarsal conjunctiva.

Vertical incision with a sharp-pointed canaliculus knife, with pressure and gentle curettage will empty these ducts of their oleaginous or caseous material. Often the blocking occurs near the orifices of the ducts, in which case massage of the palpebral margin will cause the evacuation of the contents. I have found the following manipulation effective: the upper and lower (closed) lids are grasped by the forefinger and thumb of one hand. Thus each lid is partially everted and the tarsal surfaces are apposed. The ducts are emptied by pressure combined with a lateral and antero-posterior sliding motion of one tarsal surface over the other. Occasionally, it may be advisable to apply pressure with the thumbnails.

#### *Occult Chalazia.*

Very small chalazial masses may not present any elevation, either on the conjunctival or skin surface, and may not be palpable. In such cases, the exact location of the mass is difficult to determine. I have found it of advantage to blanch the conjunctiva thoroughly with a cocain-epinephrin mixture, which will clearly define the area to be incised. The tarsal conjunctiva immediately over the chalazion will appear as a darker ring or oval and can thus be readily differentiated from the uniformly blanched tarsal conjunctiva.

#### *Chalazion the Cause of Epiphora and Astigmatism.*

On several occasions, I have observed that a small chalazion, situated near the nasal end of the lower lid, has slightly everted the lower punctum, thus causing an annoying epiphora which disappeared after curettage of the chalazial contents. We are all familiar with the fact that a large chalazion, by exerting constant pressure, may so deform the cornea as to produce a transitory but regular astigmatism.

#### *Papillary Elevations of the Tarsal Conjunctiva.*

Frequently the tarsal conjunctiva, in ametropia, presents minute elevations, which appear most abundantly at the upper tarsal edge, especially toward the inner and outer angles. There is little or no discharge. Usually correction of the ametropia associated with a mild astringent collyrium suffices to smooth out the elevations. If, after a few weeks, they still persist, a mild form of expression by means of Kuhnt's or Gifford's forceps is very effective. A very mild conjunctivitis, with the formation of follicles, similar in type to that incident to atropin and eserine irritations, is occasionally seen in association with hyperopia or

hyperopic astigmatism. This condition usually yields rapidly to glasses and astringents. If it does not, the lids should be cocaine-ized and rubbed with gauze dipped in boric acid powder.

#### *Vernal Conjunctivitis.*

In the severe form the diagnosis is, or should be, easy. Unfortunately, it is too often mistaken for trachoma and treated on this assumption. On the other hand the mild form (and there are many cases which give rise to symptoms but show very little to inspection), is apt to be regarded as the conjunctival reaction to ametropia, and hence goes untreated, save for a correction of the refraction.

#### *Conjunctivitis Due to Food Anaphylaxis.*

Recently Conlon (*American Journal of Ophthalmology*, Vol. II., No. 7, July, 1919, page 486) has described a mild, but annoying form of conjunctivitis apparently dependent on the ingestion of certain foods in individuals anaphylactic to these foods. The protein skin test as described by Walker in his investigations of the cause of bronchial asthma, is applied. Prompt cure has followed the withholding of the offending food material: with a recurrence of the trouble on the resumption of this food.

#### *Caseous Deposits and Concretions.*

Rarely in children, more frequently in adults, one finds scattered here and there in the normal appearing tarsal conjunctiva, tiny round light yellow masses. On puncture a small spherical or slightly flattened soft or hard, homogeneous mass, can be lifted out. Sometimes they are adherent to the conjunctiva, again they appear to lie free in a tiny cavity. Probably they do not, as a rule, give rise to symptoms, but when elevated above the level of the tarsal conjunctiva may evoke the sensation of a foreign body and then require removal.

Similar deposits are more frequently found in elderly people. They appear as white and yellow specks superficially or deeply situated, generally distributed throughout the tarsal conjunctiva, but showing an especial predilection for the upper and lower cul-de-sacs. They are, according to Parsons (*Pathology of the Eye*, 1904, Vol. I., page 93) "the products of degeneration of cells and mucoid exudate in the lumen of minute cysts," which are "retention cysts of glands of new formation, due to irritation, and also of the so-called Henle's glands." Each cystic space contains from one to five concretions. They do not contain calcium carbonate or phosphate. Like all such degeneration products, they

stain variously and according to Parsons (Path. of the Eye 1904, Vol I., page 94) "belong to that indeterminate quantity—von Recklinghausen's hyalin." As these deposits may project above the surface and are surrounded by an area of lymphocytic infiltration, it is clear that they serve to perpetuate a low grade conjunctival inflammation. The treatment is simple and satisfactory. Under the magnification of the loupe every individual cyst is punctured and its contained masses lifted or curetted out. This is often a very tedious process as each lid may contain from twenty-five to fifty concretions, and it is important that the work be very thorough. Such lids often contain many blocked Meibomian ducts and the little operation is best concluded by thumb and finger massage of the edge of the lid.

Illustrative Case: Mr. B., aged 60. Complains of "heavy feeling in lids," burning and lacrimation in use. Refraction—R. and L.  $+ .75$  Sph., V. 6 5. Orthophoria. Bifocals prescribed. R. and L.  $+ .75$  sph;  $+ 2.5$  sph. added. Symptoms not improved. Disinclined to wear bifocals. Evacuated half a dozen cysts, removed twenty to thirty concretions from each lid, curetted a small chalazion, and massaged the lid margins. Astringent collyrium of zinc sulphat. Within a week, symptoms improved. After three months, lids normal. Wears bifocals with comfort.

#### *Pinguecula.*

The vast majority of pingueculae give rise to no symptoms and require no treatment. In persons exposed to dust, smoke and other forms of mechanical irritation, these little affairs may have a recurrent inflammation with attendant discomfort. If astringent lotions fail to prevent recurrences, the pinguecula should be excised.

#### *Warts.*

Small warty growths on the lids or lid margins—verruca senilis—are not at all rare. Sometimes they occupy the intermarginal space. Again one may be found encroaching on or overlapping the sharp inner border of the lid. In such a situation, rapid closure of the lids is apt to bring the rough edge of the wart into contact with the cornea and produce the sensation of a foreign body. Abscission, with cauterization of the base by trichloroacetic acid is indicated.

Cysts of Moll's glands are tiny retention cysts which occur at the edge of the lids. A patient is often aware of their presence only by close examination of his lids in the mirror. On the other hand, they may be very annoying by giving rise to a foreign body sensation. They are easily gotten rid of by puncture and

pressure-massage. Sometimes the walls of these cysts proliferate, producing more or less solid tumors.

#### *Aberrant Lashes.*

In lids wholly free from cicatricial changes, and in which there is no distichiasis, I have occasionally observed the presence of a few very fine light coloured hairs springing from the lid margin just internal to the normal row of cilia. They tend to curve back and irritate the cornea. They should be destroyed by the electric needle. The lashes at the outer angle may, through spasmodic closure of the lid, be swept backward and caught between the lid and the globe, there to remain until released by a strabismus hook. There is a tendency to recurrence which can usually be overcome by stroking the lashes outward. In one patient a canthoplasty was required. Sometimes a cilium as it emerges from its follicle will burrow under the skin. As it grows the skin is stretched over it in a tiny tent-like formation. A patient recently observed, who had this condition, stated that her eye felt "drawn" and thought that her glasses needed changing.

Broken off ends of cilia and the short ends of the scalp hairs (following a hair-cut) may lodge in the puncta and cause irritation.

Occasionally the tiny hairs of the caruncle grow long and curving outward and downward irritate the bulbar conjunctiva.

#### *Foreign Body on the Cornea.*

Failure carefully to inspect the cornea may lead to the ridiculous attempt to abolish the discomfort arising from an imbedded foreign body with a pair of glasses; such a case has recently been brought to my attention.

#### *Excoriations at the Outer Angle.*

These little solutions of continuity are often very tiny and may escape detection unless carefully sought for with the loupe. They yield readily to lunar caustic and yellow oxid of mercury.

#### *Spastic Entropion.*

It should not be forgotten that spastic entropion may not be constantly present and hence may not show during the patient's visit to the office. In the case of elderly persons, I make it a practice to explain the nature of this trouble to the members of the family so that a watch may be kept for the appearance of this annoying condition.



*Mild Squamous Blepharitis.*

The very mild form of this affection is apt to be overlooked. It is so frequently the ocular manifestation of a seborrheic eczema of the skin or scalp that I have found it of great advantage to treat this condition in collaboration with a dermatologist.

I have endeavored to present, as briefly as possible, some of the minor ailments of the anterior ocular segment which may and often do, give rise to ocular discomfort. Some of the symptoms evocable by these ailments are indistinguishable from some of the symptoms due to uncorrected ametropia and muscular defects. A patient's symptom-group may depend partly on the troubles in the lids, conjunctiva or cornea, and partly on his need for glasses. Sometimes his discomfort is psychic or due to some general disorder. The outspoken conjunctivitis, keratitis, chalazion, etc., makes itself heard and needs no introduction. If I have been able to arouse your interest in some of the minor disorders, which, though minor, may yet be provocative of great ocular discomfort, the purpose of this paper will have been accomplished.

## DISCUSSION

DR. F. F. TEAL, Lincoln, Neb.: This subject might seem, on first thought, a simple proposition, but the more you dwell on it the wider its scope appears.

The chief point in the paper, it seems to me, is the necessity of accurate and painstaking observation in our work. A failure in this direction can usually be attributed to two causes; the lack of proper training and development of the powers of observation, and second, carelessness, which is usually the result of the press of too much work. How often you hear the excuse of "not enough time to make the necessary laboratory, nose, perimetric, etc., examinations," as a routine measure in a busy oculist's daily experiences. To this latter element there is this answer: such a man had better cut down the number of his clients or what is more to the point, reorganize his office by adding an assistant, nurse or other help, who can be trained to take on many of the routine details which must otherwise be necessarily hastily performed or not at all.

Another point in eye examinations which the writer brings out, is the use of suitable apparatus to aid in the search for abnormal conditions in lids, conjunctiva or cornea. I am well aware that daylight is recommended by many oculists over artificial illumination to aid in eye examinations; but we do not always have bright days, and some of our work may of necessity come at night. When one becomes accustomed, therefore, to the right kind of artificial illumination, with condensing lens, loupe or what not, and uses the same routine technic in such examinations of the eye as indicated by the

writer, he gradually grows less careless, more proficient, and finally expert in such work.

If you listened closely to Dr. Green's paper you will have noticed that he has a regular systematic method of examining the lids, conjunctiva and cornea, which further emphasizes his thoroughness as an observer. In addition to the conditions found in such an examination, I might mention face powder as an occasional cause of conjunctivitis.

Summer, of Boston, has observed that many cases of follicular conjunctivitis in children clear up after the removal of adenoids. He claims a direct connection between the lymphatic tissue of the conjunctiva and the nose.

We need papers like this one to get us into the right track and we cannot have these lessons brought to our attention too often.

DR. G. E. DE SCHWEINITZ, Philadelphia: This timely and excellent paper has well emphasized the need of searching in many cases of asthenopia for causes other than those which pertain to refractive errors and muscle imbalance. Long ago, it will be remembered, Schweigger wrote concerning the asthenopia depending upon various types of conjunctival irritation, not dissipated by the adjustment of glasses alone, and once, years ago, I ventured to write a paper on the "Mimicry of Eye-strain," even if the title was not well chosen, in which I recorded ocular symptoms that did not yield to optical therapeutics. Three groups have always seemed to me interesting: First, persisting burning or tingling along the margins of the lids, provoked and increased especially by the use of the eyes in artificial light, but not relieved by the most accurate adjustment of glasses. In most of these instances the basal cause depends upon the so-called gouty or uratic diathesis, and cure follows suitable dietetic and medicinal measures. The condition is analagous to the tingling in the feet which in olden days was called the "lispings of the gout." Second, lid hyperemia or mild blepharitis, due in many instances to the Morax-Axenfeld bacillus, and quickly cured by applications of zinc sulphat or chlorid. Third, a considerable number of cases of asthenopia quite surely in association with various types of nasal disease, rhinitis, vasoparetic turbinals, etc., to which reference has been made at an earlier period of this meeting. These are the so-called "nasal asthenopias." It goes without saying that in all the cases belonging to these groups and to those Dr. Green has described, the refractive error must be corrected, but of itself this may not be sufficient, and hence the need of the examinations which Dr. Green has so well described. That pressure caused by a chalazion may prevent the accurate determination of the axis of a cylindrical glass is well known, and removal of a chalazion prior to the measurement of glasses is a wise procedure.

DR. H. B. LEMERE, Omaha: I have enjoyed Dr. Green's paper very much. One addition I wish to state from my own experience in the effect of the tonsils on the conjunctiva. There is a certain form of conjunctivitis which is so distinctive of infected tonsils that it always suggests a throat examination. This conjunctival condition consists of a thickening of the lower lid with follicles very much resembling trachoma. One case Dr. Banister and I both considered for some time

as a probable trachoma till removal of the tonsils cleared up the chronic lid condition.

DR. GREEN, (closing discussion.): I am glad Dr. Teal is in agreement with me as to the necessity for careful observation and correction of these minor conditions. Might we not designate the symptoms arising from these conditions as "palpebral asthenopia?"

I perfectly recall Dr. de Schweinitz's paper on "Mimicries of Eye-Strain," a very apt title, it seems to me. The symptomatology of these conditions bears so close a resemblance to the symptomatology of accommodative and muscular asthenopia that one should always be on the lookout for their presence. I purposely omitted a discussion of asthenopia due to nasal disease; I am well aware of this possibility, however.

I am glad Dr. Lemere called my attention to the peculiar thickening of the lower lid associated with diseased tonsils. This observation I had not, personally, made.

## THE CLOSURE OF TRAUMATIC SUBCONJUNCTIVAL CORNEO-SCLERAL FISTULAE

HARRY S. GRADLE, M.D.

CHICAGO

A subconjunctival corneo-scleral fistula, or as it is termed, a filtering cicatrix, is a much desired end-result in certain operations for glaucoma and the possible danger of late infection can be neglected in view of the relief of hypertension afforded by this scar. But in young individuals who carry such a cicatrix as a result of trauma, the danger of infection through the filtering fistula throughout the remainder of their life, is an unnecessary risk. Consequently the eradication of such an area of filtration is a measure, the risk of which is justified by the elimination of the danger of future infection. That the risk is not as great as might seem at first blush may be seen by a recital of two such cases.

CASE 1. A young man of about 23 years came to the Eye Service in General Hospital No. 28, U. S. Army, for some minor eye complaint. On examination, a one millimeter corneo-scleral subconjunctival fistula was found at the outer limbus of the right eye. There was good subconjunctival filtration as shown by the conjunctival bleb which was about one centimeter in diameter and about two millimeters high. The pupil was distorted and drawn toward the scar, resulting in a pear-shaped pupil, lying horizontally. The remainder of the eye was normal, although the vision was somewhat deficient. The tension was normal.

No history of trauma of any sort could be obtained. The patient did not know of his ocular anomaly and consequently could not place the beginning of the condition. Although it was patently not a congenital anomaly, the time of injury could not be fixed. Incidentally the patient had the mentality of approximately an eight year old.

Under local anesthesia, a large semicircular conjunctival flap with the fistula as a center was dissected free and laid over the cornea, and the fistula laid bare by blunt dissection. A knuckle of iris filled the posterior portion of the fistulous tract of which the anterior portion was kept free by aqueous drainage. Eserin was instilled into the conjunctival sac and

with a cyclodialysis spatula, an attempt was made to replace the partially prolapsed iris. The iris sphincter contracted promptly and with the slight mechanical aid, an almost round pupil was obtained. The edges of the fistula were curetted lightly with a small sharp knife and a very fine silk suture introduced. The needle was entered into the sclera about one millimeter from the edge of the fistula approximately one-half way through the thickness of the sclera. The second bite was taken through the sclera on the opposite edge of the fistula in precisely the same manner, as seen in the accompanying diagram. Tying this suture completely closed the fistula and it was not necessary to make an opening of the anterior chamber on the opposite side of the cornea, as was originally considered in order to minimize the pressure on the internal side of the fistula. The conjunctival flap was replaced and held in position with two light sutures.

Atropin was instilled and both eyes bandaged. At the daily dressings, both atropin and eserine were used in order to force the maximum pupillary play. After the third day, the conjunctival flap was again laid back and the scleral suture removed, following which the flap was replaced. Healing was uneventful and at the end of ten days, the patient was returned to duty. At that time, the fistula was completely closed, there was no conjunctival bleb, the anterior chamber was of normal depth, and the pupil was nearly round, although still slightly oval in the horizontal diameter. The tension was normal.

CASE 2. A sixteen year old boy was struck in the right eye with the point of a knife in July, 1919. When seen 24 hours later, he presented a moderately injected globe with a clean incised wound through the corneo-scleral margin at meridian 110, extending about three millimeters into the sclera and four millimeters into the cornea. There was a prolapse of a small amount of iris, ciliary body, and vitreous into the wound. The vision was mere light perception and projection owing to extensive hemorrhage into the vitreous. The eye was flushed with oxycyanid and the prolapsed tissues replaced as far as possible and the scleral wound closed with one silk suture. Urotropin was administered per os in large quantities and under the usual local treatment, the eye became pale in three weeks.

In May, 1920, the eye was pale (having remained uninjected for nearly a year). Over the site of the wound was a

large conjunctival bleb that had been increasing steadily, although but slightly, in size for the past six months. Underneath the bleb was a one millimeter corneo-scleral fistula. The iris was drawn into this fistula so that the pupil presented the picture of a postoperative coloboma, despite the fact that no tissue had been removed after the original injury. The vision with a minus cylinder was but a fraction under normal, although there was a distinct hypotonicity of the eye.

Under local anesthesia, a large semicircular flap with the fistula as a center, was dissected free and the fistula exposed by blunt dissection. Eserin was instilled into the conjunctival sac and an attempt was made with a cyclodialysis spatula to restore the shape and position of the original pupil. But the adhesions holding the pupil were too dense to be broken by such force as was deemed safe to use. Consequently the endeavor to restore the pupil was abandoned and the fistula was closed with a single suture as in the previous case with the exception that the suture was carried through the conjunctiva and tied over the gold plate used by Wiener in his corneal operations. The conjunctiva flap was restored into place the periphery held with two light sutures. All sutures were removed on the third day.

The course of healing was uneventful and the patient was discharged from the hospital within a week. To date, the conjunctiva over the site of the former fistula has remained flat and there seems to be no drainage from the anterior chamber. The pupil is still distorted toward the site of the wound and the vision has returned to but a fraction under normal when corrected with a minus cylinder. The anterior chamber is of normal depth and the lens and fundus are normal, as is the intraocular tension.

These two cases illustrate the simplicity of closure of a corneo-scleral fistula that is not necessary for the restitution of the balance of intraocular pressure. Although the fistula per se has no influence upon the vision and undoubtedly an eye with such a filtering cicatrix would maintain its integrity throughout the life of the individual, still the danger of infection through the fistula is sufficiently great to warrant the operation and eliminate such a risk.

## DISCUSSION

DR. MEYER WIENER, St. Louis: These cases reported by Dr. Gradle are extremely interesting, and I take it that they must be of rather rare occurrence. Personally, I have never seen a traumatic fistula of the corneo-scleral margin. While I was in the service at Ft. Oglethorpe I saw a case of fistula of the cornea itself in an old negro who had suffered injury from a powder explosion in a mine, and there was a constant leaking from the anterior chamber. It had gone on for many years I was told. I closed this fistula by freshening the edges with a scalpel and using a suture passed through the cornea and tied over the small gold plates that I use in all corneal work. It closed the fistula. I take it it is not Dr. Gradle's intention to limit this closing to the fistula of traumatic origin. I have seen cases where sclero-corneal fistula, the result of operative procedure, might be a danger and menace to the eye from late infection, etc., where we got a larger drainage than we intended. I believe that the conception of the idea of closing the sclero-corneal fistula should be recommended, as there are undoubtedly frequent cases in our practice where we might be glad of the suggestion, making the opening at least smaller and raising the tension to that nearly approaching the normal.

DR. J. G. PARSONS, Sioux Falls, S. D.: Dr. Gradle's interesting paper calls to mind a case very similar to the first one he records, which I saw some fifteen years ago. While playing "mumblety-peg" in a country school room, the patient, a boy of ten, was pushed by a playmate so that his face came down on the point of his knife, which entered the right eye in the corneo-scleral region. He received simple cleansing of the wound at home, and when first seen by me had a fistula in the upper limbus, with an iris hernia. Fortunately there had been no infection. The treatment followed was substantially that outlined by Dr. Gradle, with the exception of the use of eserine. Excellent results followed.

DR. LEE MASTEN FRANCIS, Buffalo: May I say in connection with this that I have in preparation now a paper which covers the conjunctival flap. I believe it is not necessary to bury the suture which closes the fistula, nor is it necessary to use a plate. I have been dealing with some of these cases in which I merely mattressed the suture through the conjunctival flap with excellent results, a procedure more simple than the use of the plate.

DR. HARRY GRADLE (closing discussion): These cases are, fortunately, uncommon. The type of suture can be used in traumatic ruptures of the sclera, not necessarily involving the corneo-scleral margin. The plate is used in order to change the angle of the tension of the suture from parallel to the fibers of the sclera to right angle to such fibers.

## A COMPARISON OF TWO METHODS OF APPLYING PRISM TESTS TO THE EYES

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FREEPORT, ILL.

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During a visit at this laboratory, Dr. Lucien Howe suggested that with such a large number of men with normal visual functions available, an unusual opportunity was offered for the comparison of two methods of applying prism tests to the eyes. *The first method, the one most widely used in practice*, is to begin with a small prism and gradually increase its strength until diplopia is obtained. In psychophysical terms this method is called the ascending method. The other, the descending method, is to begin with a prism of sufficient strength to produce diplopia and decrease its strength until binocular single vision is restored.

The apparatus used in this work was a de Zeng phorometer, a Maddox rod, and a 7-millimeter spot of light.

The subject's age was recorded. His near point of convergence was taken and his near point of accommodation for each eye separately, using the Duane disk and the Prince rule. His visual acuity was measured with the Snellen test letters. If the subject wore glasses his correction was worn during the experiment.

The phorometer was placed 6 meters from the spot of light at the level of the subject's eyes and adjusted for the interpupillary distance. As the Maddox rod attached to the phorometer was too far from the subject, a rod from the trial case was placed in the cell nearest the left eye. The rotary prism was also placed before the left eye, the right remaining unobstructed. The left eye was covered with a card and the subject instructed to fix the light for several seconds with the right. The left eye was then uncovered for a short time and the subject asked to state the relation of the light and the streak. If necessary, the prism was rotated until the streak was seen passing through the light. The left eye was then covered and uncovered several times and an adjustment of the rotary prism made. When the streak seemed to pass through



1	W. R. R.
2	J. F. C.
3	J. M. P.
4	A. B. A.
5	L. N. D.
6	C. L. C.
7	R. B. P.
8	O. C. L.
9	E. D. B.
10	J. K. B.
11	E. B. C.
12	L. A. E.
13	D. W.
14	L. P. M.
15	W. J. H.
16	H. T. C.
17	O. G. F.
18	W. B. S.
19	R. A. C.
20	W. A. T.
21	I. J. T.
22	F. S. R.
23	W. A. F.
24	L. P. H.
25	K. W. P.
26	R. D. L.
27	T. F. L.
28	P. P. M.
29	J. M. H.
30	R. E. W.
31	E. F. L.
32	T. J. R.
33	W. J. R.
34	D. B. L.
35	B. V. C.
36	R. C. S.
37	J. H. B.
38	R. B. H.
39	J. W. M.
40	F. M. S.
41	T. P. H.
42	R. E. T.
43	J. G. B.
44	L. K. A.
45	A. P.
46	J. H. E.
47	E. F. M.
48	C. E. W.
49	C. S. U.
50	F. C. K.
51	E. P. L.
52	F. M. L.
53	J. A. A.
54	L. R. S.

TABLE 1

[illegible]

the light immediately upon uncovering the eye, the scale reading was recorded as the subject's phoria.\*

In order to familiarize the subject with the experiment he was practiced by rapidly producing diplopia with prism base in, base out, base up, and base down. The subject's prism divergence, prism convergence, and prism sursumvergence was taken first with the prism before the right eye, then with the prism before the left eye. The prism was rotated slowly and continuously except when taking convergence by the ascending method. In that case the prism strength was changed more rapidly until near the subject's limit. If the ascending method showed the subject's convergence to be more than 25 prism diopters, then the prism strength could also be decreased rapidly in the descending method for the same subject. During the experiment the subject was encouraged to maintain fusion when the ascending method was being used and to regain fusion in the case of the descending method. Prism divergence was found to have more or less fixed limits and one reading was deemed sufficient. Prism convergence, however, increases with practice, so the average of three readings was recorded. A rest was given between the determinations of prism divergence, prism convergence, and prism sursumvergence to avoid the effects of fatigue.

To measure the phoria and prism convergence for near, a small spot of light was held at a distance of 13 inches. The convergence was determined by the ascending and descending methods for both eyes.

Fifty-one pilots and observers, returned from duty overseas, and three nonfliers with vision 20/20 or better were examined. Seven of the subjects, of whom five were fliers, were found to have disqualifying heterophoria. The detailed results of the experiments are given in Table I.

An examination of Table I shows that, with two exceptions, every determination of convergence, divergence, and sursumvergence by the descending method is less than the corresponding one taken by the ascending method. This is to be expected, as the individual has been accustomed to fusion since childhood and tends to retain it as long as possible in the ascending method. On the other hand, when diplopia is pro-

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\*From here on in this paper, the term "phoria" will be used to designate any relations that the light bears to the streak, i. e., orthophoria as well as heterophoria.

duced it is more difficult to regain fusion. L. R. S. (case 54), for example, found it impossible to regain binocular single vision until the prism strength was reduced to zero in determining his divergence for distance by the descending method.

In comparing the two methods the correlations in Table II were computed. In this table  $r$ , the coefficient of correlation, is given, followed by its probable error. To illustrate, if  $r$  should equal 1.00 this would mean perfect correlation; for each change in phoria an exactly proportionate change in prism con-

TABLE II.

Distant data correlations.	Ascending.	Descending.
Convergence $\pi$ . Phoria.....	<div> { O. D. ....<math>r=0.118 \pm 0.0904</math> </div> <div> { O. S. ....<math>r=0.103</math> </div>	<div> <math>r=0.279 \pm 0.0847</math> </div> <div> <math>r=0.001</math> </div>
Divergence $\pi$ . Phoria.....	<div> { O. D. ....<math>r=0.648 \pm 0.0532</math> </div> <div> { O. S. ....<math>r=0.462 \pm 0.0721</math> </div>	<div> <math>r=0.86 \pm 0.0238</math> </div> <div> <math>r=0.406 \pm 0.0766</math> </div>
Near.		
Convergence $\pi$ . Phoria.....	<div> { O. D. ....<math>r=0.379 \pm 0.079</math> </div> <div> { O. S. ....<math>r=0.180 \pm 0.089</math> </div>	<div> <math>r=0.51 \pm 0.068</math> </div> <div> <math>r=0.282 \pm 0.084</math> </div>
Angle of convergence $\pi$ . sum of right and left convergence.....	O. U. .... $r=0.448 \pm 0.073$	$r=0.431 \pm 0.075$
Angle of convergence $\pi$ . Phoria...	$r=0.222 \pm 0.087$	
Accommodation $\pi$ . Phoria.....	$r=0.1614 \pm 0.089$ Also $\text{Eta}=0.804 \pm 0.034$	
Distance.		
Convergence ascending $\pi$ . Conver- gence descending.....	O. D. .... $0.411 \pm 0.0762$	

vergence or divergence. On the other hand, should  $r$  equal 0.00 no such relationship whatever would be indicated. A correlation is considered reliable only when  $r$  is three or more times its probable error. If exactly three times, the odds are 21 to 1 that the correlation is not due to chance.

It must be clearly understood here that the coefficient of correlation does not in any way indicate how rapidly one of the correlated factors changes with reference to the other. It is to be looked on only as an index of the closeness of agreement to some such proportionate variation and not at all as a measure of the proportion.

Bearing this in mind, the results stated in Table II show the following:

(1) Convergence and divergence taken by the descending method show a higher correlation with phoria for the case of the right eye than in the case of the left.

(2) For the right eye the correlation is higher in the case of the descending method than in the case of the ascending.

These conclusions apply especially to the case of prism divergence and phoria for distance, less to convergence and phoria for near and are least applicable to the cases of convergence and phoria for distance.

(3) In the case of the left eye, convergence or divergence and phoria, the difference in the coefficient of correlation as between the ascending and descending methods is insignificant. The reason for stating this is that the difference is not in any case much greater than its probable error.

(4) On the whole the correlations between convergence or divergence and phoria are closer for the descending method than for the ascending method. Differences in the contrary direction are not significant in amount.

(5) In all of these cases the correlations for the right eyes are higher than those for the left. (Although any explanation of this difference is not within the province of this paper, it must be remembered that the phoria was taken with the Maddox rod over the left eye and plotted with prism divergence or convergence taken over the right eye.) The angle of convergence plotted against the sum of the right and left prism convergence (for near) gives reliable correlation for both methods. The slight difference between the two is not significant because its probable error is very high.

(6) A high correlation could not be expected between angle convergence and phoria, as the near point of convergence is closer to the eye than the limit of the range of accommodation, while the phoria for near was taken within the range of the accommodation.

(7) The correlation between accommodation and phoria, owing to its nature, was worked out by a different method and a high correlation was obtained as represented by the value of Eta. This correlation was nonlinear and was so treated.<sup>1</sup>

Table III shows the average prism convergence and prism divergence and their ratios for the right eye, the left eye, and both eyes by each method. The results were separated into cases of orthophoria, esophoria (2 classes), and exophoria (2 classes).

To quote de Schweinitz in writing of the ratio of adduction to abduction, "Stevens says this ratio should be 6 to 1,

TABLE III.

Distance.	Average prism converg. ascend. mg.	Average prism converg. descend. mg.	Ratio of converg. ascend. mg. to diverg. ascend. mg.	Average prism converg. descend. mg.	Ratio of converg. descend. mg. to diverg. descend. mg.
Orthophoria (15 cases).....					
Right.....	19.93	19.47	2.85	5.47	1.91
Left.....	19.67	12.40	3.81	4.93	2.57
Both.....	19.80	11.43	2.82	5.20	2.3
Esophoria $\frac{1}{2}$ to esophoria 2, inclusive (25 cases) [Av. 1.3°].....					
Right.....	18.52	9.88	3.13	4.30	3.35
Left.....	20.52	10.32	3.52	4.08	2.53
Both.....	19.52	10.10	3.32	4.14	2.44
Over 2 esophoria (5 cases).....					
Right.....	20.60	15.80	4.68	2.40	6.58
Left.....	19.80	12.60	3.67	3.90	3.94
Both.....	20.2	14.20	4.12	2.80	5.07
Exophoria $\frac{1}{2}$ to exophoria 2, inclusive (7 cases) [Av. 0.71°].....					
Right.....	17.57	9.86	2.32	5.71	1.7
Left.....	19.14	10.43	2.85	5.14	2.63
Both.....	18.36	10.14	2.57	5.43	1.87
Over 2 exophoria (2 cases).....					
Right.....	19.0	14.00	2.11	7.00	2.00
Left.....	16.0	12.00	1.68	8.50	1.41
Both.....	17.5	13.00	1.89	7.75	1.68

but, according to Risley, in carefully corrected or emmetropic eyes the ratio is 3 to 1. Banister found the primary adduction for 6 meters to be only 14 degrees." The writer believes part of the seeming discrepancy is due to the failure to separate the phorias. This ratio for 15 cases of orthophoria was 2.82 (o. u.) to 1 for the ascending method and 2.20 to 1 for the descending method.

For esophoria the prism convergence increased and the prism divergence diminished, hence the ratio increased. For exophoria the convergence diminished and the divergence increased, so the ratio diminished.

Table III shows the following results for both methods:

(a) For esophoria (25 cases) or exophoria (7 cases) ( $1\frac{1}{2}$  to 2 prism diopters, inclusive), right convergence less than left convergence; right divergence greater than left divergence.

(b) For esophoria (5 cases) or exophoria (2 cases) (over 2 prism diopters), right convergence greater than left convergence; right divergence less than left divergence.

(c) For orthophoria, the descending method shows results similar to those obtained in esophorias and exophorias ( $1\frac{1}{2}$  to 2 prism diopters, inclusive), viz, right convergence less than left convergence; right divergence greater than left divergence.

TABLE IV

Distance, divergence,	Right eye.				Left eye.			
	Ascending.		Descending.		Ascending.		Descending.	
	Exo- pho- ria.	Eso- pho- ria.	Exo- pho- ria.	Eso- pho- ria.	Exo- pho- ria.	Eso- pho- ria.	Exo- pho- ria.	Eso- pho- ria.
0.....		5.640		4.904		4.274		2.198
1.....		4.894		4.030		3.720		2.460
2.....		4.119		3.156		3.165		2.601
3.....		3.364		2.282		2.611		1.543
4.....		2.609		1.408		2.056		1.085
5.....		1.854		.534		1.502		.627
6.....		1.099	0.340			.947		.168
7.....		.344	1.214			.393	0.290	
8.....	0.410		2.088		0.161		.748	
9.....	1.165		2.962		.716		1.207	

In 25 cases of esophoria (from  $1\frac{1}{2}$  to 2, inclusive) by both methods, these data show that the prism convergence is less for the right eye (fixing eye) and the prism divergence is greater. The writer's explanation of this is that as the right was the fixing eye in all these cases, in order to produce an esophoria, the average convergence of the left eye had to increase or its average divergence diminish or both conditions prevail. In

these 25 cases both conditions held good for the average of both the ascending and descending methods.

Table IV shows the average amounts of phoria to be expected with varying degrees of divergence. This table was gotten by computing the values of  $x$  (phoria) in terms of  $y$  (divergence). The results in this table agree very well with those in Table III, and the exceptions to this agreement may be

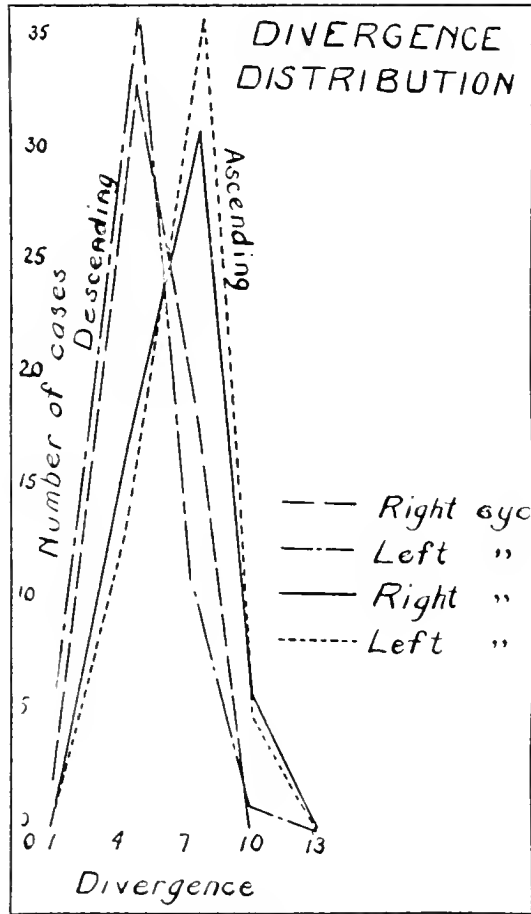


Figure 1.

explained by stating that Table IV gives the average phoria expected from various degrees of divergence, while Table III gives the average divergence actually obtained in cases grouped according to their phoria.

Figures 1 and 2 show the distribution curves of the cases



# CONVERGENCE DISTRIBUTION

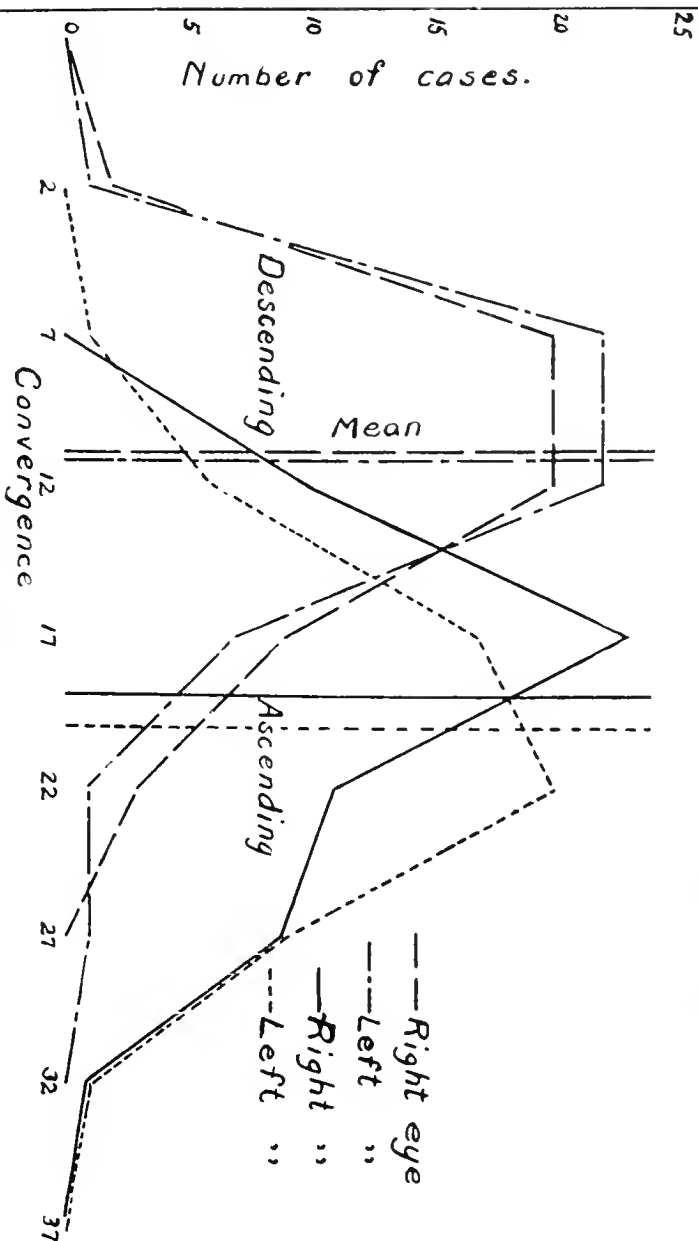


Figure 2.

for divergence and convergence respectively by both ascending and descending methods. Generally speaking, the better standard of measure will show a distribution curve of less range. To express this in another way, the standard deviation ( $\sigma$ ) will be less. In figure 2 the descending method shows less standard deviation and this advantage is quite well marked. In figure 1 the advantage in this regard is slightly with the ascending method. Taken on the whole, the descending method seems to produce the better curves.

The following conclusions are based on the hypothesis that associated with phoria there should be corresponding changes in prism convergence and prism divergence. This relationship is shown by both ascending and descending methods. Whenever there is a large difference in the closeness of agreement to such a relationship, shown between the two methods, the descending method has the advantage.

After obtaining the prism strength of a given subject's external eye muscles, one must know also his phoria in order to say whether or not this subject has an adequate muscle balance. Take, for example, cases Nos. 17 and 18, in which the prism strengths of the external eye muscles, by both methods for distance are identical (or practically so). However, case No. 17 has an esophoria of six prism diopters for distance and case No. 18 an exophoria of one prism diopter.

A statement of the normal ratio of adduction to abduction is not adequately qualified by saying that the eyes, upon which the measurements were made, were emmetropic. The writer's results, by both methods, show that this ratio bears a definite relation to the state of balance of the external eye muscles. (See Table III).

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## WHY WE ACCOMMODATE

CLARENCE LOEB, A. M., M. D.

CHICAGO

It would seem supererogatory to bring up the subject of accommodation before this Society, since the main facts of the mechanism of accommodation are well known to all of you. And yet, conversation with some of our best informed members has failed to bring an answer to the question of *why* we accommodate, and I do not recall ever having seen in the literature an explanation. It seems to have been accepted as a fact, without exciting any special interest in the reason, like many other common occurrences.

This question may be stated in a somewhat different form namely, what phenomenon occurs within the eye when an object is brought from 6 meters away to 1 meter from the eye, that sets up the train of events culminating in an increase in the curvature of the lens of sufficient amount to enable the individual to see it distinctly at the latter distance? Conversely, what occurs when the object is moved from the latter to the former distance that causes a reversal or nullification of the previous state, so that the curvature of the lens becomes less?

It is perhaps impossible to obtain an answer to these questions whose correctness can be proven, but it is at least possible to discuss the factors entering into the problem, in an attempt to formulate a theory which will satisfactorily explain the initiation of the act of accommodation.

In the following discussion, the associated acts of convergence and contraction of the pupil will be disregarded, for while they are synergistic, they are not essential to the act of accommodation. Convergence may take place when the accommodation of one or both eyes is paralyzed, and conversely, accommodation is still present in the remaining eye when one has been removed. Paralysis of the accommodation is usually associated with paralysis of the sphincter iridis, but the reverse is not always true, since it is possible to dilate the pupil without affecting the accommodation, for example by decreasing the amount of light entering the eye. Therefore it is possible,

from a causal standpoint, to regard the act of accommodation as an isolated one.

When an object is brought closer to the eye than 6 meters, two physical facts follow: in the first place, the visual angle formed at the eye by the rays from the extremities of the object becomes larger, and this increase is proportionate to the proximity of the object to the eye. In the second place, the rays of light originating at any point on the surface of the object, after passing through the dioptric system of the eye no longer meet at their former focus, but at some point posterior to it, dependent on the proximity of the object to the eye. This of course assumes that the accommodation is inactive.

Within certain limits, the size of the visual angle determines the size of the image formed on the retina. Now it is conceivable that as soon as this retinal image has increased beyond a certain size, or in other words, as soon as the rays from the extremity of an object have formed an image which

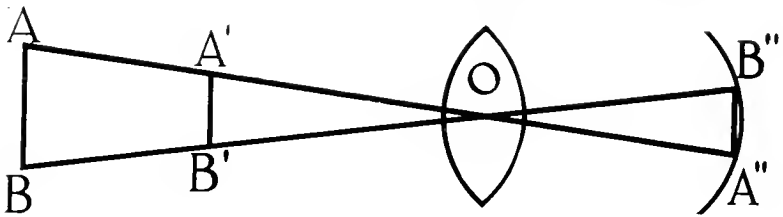


Fig. 1

extends over a certain number of rod and cones, a stimulus travels up the optic nerve to the centers of accommodation, convergence and pupillary contraction, which brings about these acts. While this is possibly true for pupillary contraction, it is certainly not true for the other two. Leaving convergence out of consideration, if accommodation were evoked by the varying size of the retinal images, the same sized retinal image should always cause the same amount of accommodation in the same eye, at least at the same period of life. But this is not true, because the image formed by an object 2 feet away from the eye is of the same size as that formed by an object 10 times its size 20 feet away, as shown by the diagram. In the former case there will be an act of accommodation, while in the latter there will be none.

Let AO and BO be rays of light from the extremities of the object AB. The AOB will be the visual angle, and B''A'' the image. But B''A'' will also be the image of every object

through whose extremities the rays  $AO$  and  $BO$  pass, for example  $A'B'$ .

The second fact might be stated somewhat differently, namely, that as an object approaches the eye, the focus of the rays arising from any point on its surface recedes, assuming that the accommodation remains quiescent. If we are dealing with a myopic eye, the focus will pass through three stages, in front of, on, and behind the retina, according as the object approaches, reaches and passes within the far point of the eye. In a hyperopic eye, and in an emmetropic one, after the object has approached closer than 6 meters, the focus is always back of the retina. Except when the focus is on the retina, the rays from any point on the object reach the retina in the form of a circle, as seen on the following diagram.

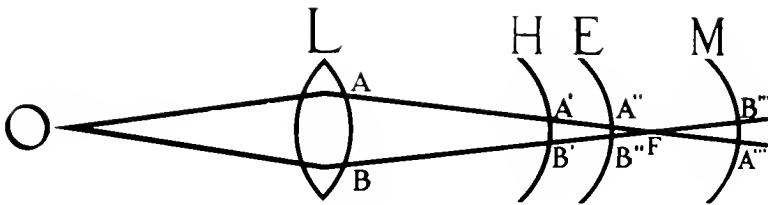


Fig. 2

Let  $L$  be the dioptric system of an eye, and  $H$ ,  $E$ , and  $M$  be the positions of the retina in the case of hyperopia, emmetropia and myopia, respectively. Let  $OA$  and  $OB$  be two rays from the point  $O$  on an object closer to the eye than 6 meters. Then  $A'B'$ , and  $A''B''$  and  $B'''A'''$  will be the diameters of the circles formed respectively upon the retinas  $H$ ,  $E$ , and  $M$  by all of the rays originating at the point  $O$ . The size of the circles in the emmetropic and hyperopic eyes is directly proportional to the proximity of the object to the eye, and in the myopic eye is indirectly proportional until the object passes within the far point when it is directly proportional. Now the amount of accommodation is also directly proportional to the proximity of the object to the eye, and it would seem a logical deduction that the amount of accommodation is directly proportionate to the size of these circles, and that therefore the appearance of and the varying size of these circles is the direct cause of the act of accommodation. But this cannot be true, because it is possible for an object at an infinite distance to form circles on the retina of a myopic eye of the same size as

those formed on a hyperopic eye. This is shown by the following diagram.

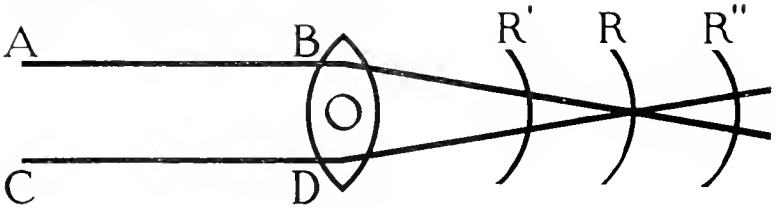


Fig. 3

Let AB and CD represent rays coming from a point on an object at an infinite distance from the eye. When they reach it, they are practically parallel. Let O represent the dioptric system of three eyes, one hyperopic, one emmetropic and one myopic. Let R', R, and R'' represent the positions of the retinas of the respective eyes. The focus falling on R, there will be no circle in the emmetropic eye, but there will be on R' and R'', and if they are at the same distance in front of and behind R respectively, the circles formed will have the same diameter. But in the hyperopic eye there will be an effort of accommodation, whereas in the myopic eye there will be none. Of course, these circles are very small, but they exist in the nonaccommodating eye, and may be graphically represented by connecting the various points formed by the intersection of the retina by the rays coming from any one point on the surface of the object. At the same time these intersected rays impinge upon and stimulate a certain number of retinal nervous elements, as shown by the following diagrams.

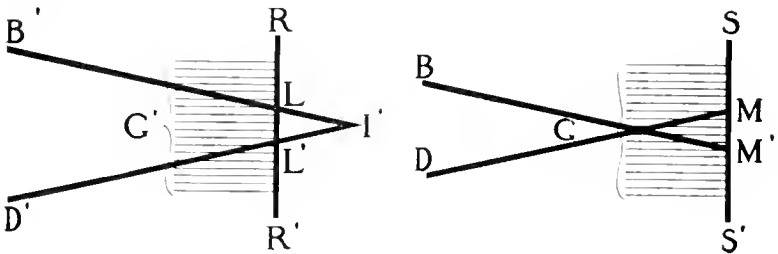


Fig. 4

Let B'I' and D'I' be two refracted rays from a point on an object situated at an infinite distance from a hyperopic eye, whose retina, R R' is intersected at the points L and L'. Let BM' and DM be two refracted rays from an object at an infinite

distance from a myopic eye, whose retina,  $S$   $S'$ , is intersected at the points  $M$  and  $M'$ , after the rays have passed beyond the focal point of the dioptric system of the eye. Let  $L$   $L'$  equal  $M$   $M'$ . Let  $G'$  and  $G$  be respectively the retinal elements traversed by the rays of the respective eyes. If these diagrams are compared, it will be seen that there are two distinct differences in the relation of the rays to the retinal elements in the two eyes. In the first place the number of elements traversed by the rays in the hyperopic eye is apparently greater than that in the myopic eye. If the object were very close to the hyperopic eye, or if the myopia were very low, this factor might enter into the problem. But as a matter of fact, the numbers of elements involved must be very small in any case, so that this feature of the problem may be disregarded. But there is a distinct and outstanding difference. In the hyperopic eye, the rays are converging, or in other words they are passing obliquely through the nerve elements, in a direction from the periphery towards the center. In the myopic eye, however, they also pass obliquely, but the direction is from the center towards the periphery. This difference in the obliqueness of the rays is, in my opinion, the cause of the presence of the accommodation in the hyperopic eye and its absence in the myopic one, when the object is beyond its far point.

Let us see what will happen in the various eyes when the position of the object is changed. In the hyperopic eye, the closer the object is to the eye, the further back is the focus of the rays, the larger is the diameter of the circles, the greater the obliqueness of the rays passing through any one retinal element, and the greater the effort of accommodation. Conversely, the further away the object is from the eye, the closer to the retina is the focus of the rays, the smaller the diameter of the circles, the less the obliqueness of the rays passing through any one element, and the less the effort of accommodation. Since the object cannot recede beyond infinity, and since the relation of the retina to the dioptric system of the eye is such that the rays are always focused behind it, the rays always pass obliquely converging through the retinal elements and there is always an active accommodation present, provided the ciliary muscle is active.

In the myopic eye, on the other hand, the closer the object is to the eye, provided it is beyond the far point, the nearer

the focus of the rays to the retina, the smaller the diameter of the circles, and the less the diverging obliqueness of the rays. At the moment the object comes closer to the eye than its far point, the focus passes beyond the retina, and the direction of the obliqueness of the rays changes from a diverging to a converging. Simultaneously, an effort of accommodation is initiated. From this point the sequence of events is the same as in the hyperopic eye. Conversely, as the object recedes from the eye, there is a decrease in the converging obliqueness of the rays, accompanied by a decreasing amount of accommodation, until the far point is passed, when they are replaced by diverging obliqueness and absence of accommodation.

In an emmetropic eye, when the object is at infinity, the focus lies on the retina, and the rays are converging as they reach the retina. In the drawings, the size of the retinal elements have been greatly exaggerated, nevertheless, they have a certain height and must be cut somewhat obliquely converging. Theoretically, at least, an emmetropic eye must be exerting some effort of accommodation, even when looking at an object at an infinite distance. When an object lies at a finite distance from the eye, the sequence of events is the same as in the hyperopic eye.

The theory which I would offer to explain the causation of accommodation, is, therefore, the following:

(1) The act of accommodation is caused by rays of light from any point on the surface of an object passing through the perceptive elements of the retina while still converging, or passing in an oblique direction from periphery towards the center.

(2) The amount of accommodative effort is directly dependent on the obliqueness with which the converging rays reach or pass through the retinal elements.

(3) Although the mechanism of accommodation is of phylogenetic origin, accommodation itself is an acquired act, due to the individual learning from his experiences that certain sensations due to converging obliqueness of rays mean that an object lies closer to his eye than their far point, requiring certain muscular efforts to permit it to be seen distinctly. This takes place so early in the life of the individual, that by the time he is a few months old it has become subconscious or involuntary.



As corollaries to this theory it should be true that:

(1) The act of accommodation should always be present in a hyperopic eye.

(2) The act of accommodation should be present in an emmetropic eye when the object looked at is at infinity (or its equivalent, 6 meters), but especially when it is at a finite distance.

(3) The act of accommodation should be present in a myopic eye whenever the object looked at is closer than the far point of the eye.

(4) The act of accommodation should be present in any eye when the rays reach it after passing through a concave lens sufficiently strong to alter their course so that they are converging when they reach the retina.

(5) The act of accommodation should be absent in any eye when the rays reach it after passing through a convex lens sufficiently strong to alter their course so that they are diverging when they reach the retina.

(6) The act of accommodation should be present in an astigmatic eye when either or both of the principal meridians refract the rays so that they converge as they approach the retina. The pain so frequently present in astigmatism is probably due to difference in the amounts and characters of the obliqueness of the rays passing through the principal meridians, resulting in differences in the amount of stimulus towards accommodation, or even in a stimulus towards accommodation and a simultaneous stimulus towards relaxation of the accommodation. This warring of stimuli or their effects causes the direct pain in the eye, or referred pain in the head, or reflex symptoms such as dizziness, malaise, or disease such as blepharitis.

(7) A myopic eye with active accommodation should accept a stronger glass than its real refraction because the tendency of a concave lens is to make the rays divergent. As soon as the focus is made to recede to the retina, there is evoked an effort of accommodation due to the converging obliqueness of the rays, which throws the focus in front of the retina, allowing a stronger concave glass to be accepted.

(8) A hyperopic eye with active accommodation can never accept a stronger glass than its real refraction, and usually will accept a weaker one, because the tendency of a convex lens is to make the rays converging. But the tendency of the

accommodation is also to make the rays converging. When the sum of the two brings the focus on to the retina, there will be clear vision. Additional strengths of convex lenses will tend to bring the focus in front of the retina and vision will be obscured until the divergence of the rays after they pass the focus causes the accommodation to relax and allows the focus to recede to the retina. As soon as the accommodation is completely relaxed, additional strengths of convex lenses will cause the rays to diverge obliquely and vision will be obscured.

This theory is offered in the hope that it will bring out a discussion of this question, and if incorrect, will lead to an investigation and a solution which will be in conformity better with known facts.

## DISCUSSION

DR. WM. H. CRISP, Denver: This is a rather ingenious explanation of the mechanism of accommodation, but it seems to fall within the class of remote reasons for things for which we have more simple explanations. When the young child is just learning to reach out for objects, the movements made in attaining any given purpose are very ineffectual. But in time the efforts become commensurate with the object to be attained. How does this happen? It happens through the education of experience. The child gradually learns that to reach a given object it has to move the arm a certain distance and it learns to gauge that distance upon the basis of experience in perspective. It seems to me that this sort of training we get in learning to regulate the act of accommodation. I think the prompt and accurate exercise of this function is due to experience rather than to some reflex action of the brain in response to the convergence or divergence of the rays of light falling upon the retina. The child, while it no doubt possesses the power of accommodation almost from birth, is not able at first to exercise the function correctly. But the eye learns that if it does not see clearly at a certain distance, it must relax accommodation or exert more accommodation until it gets the right focus, and the basis of this adjustment is largely in a knowledge of perspective.

DR. EDW. JACKSON, Denver: This paper will be of use in leading us to think more accurately and minutely about a common act. Carrying out thinking beyond its ordinary limits sets us to speculating on what else may occur beyond these limits where we have been satisfied to stop. Certain things seem to me possible weak points in the hypothesis.

The convergence of rays depends on the curvature of the dioptric surfaces of the particular eye. The rays leave the crystalline lens with a certain convergence that does not change. Whether it is a short eye, hyperopic, or a myopic eye, the convergence to and divergence from the posterior focus will be the same. The amount of their obliquity to the retinal elements will be the same in hyperopic and myopic eyes. Apparently, too, the same impulse of accommodation should come from this

degree of obliquity if the rays happen to be focused just at the retina as when focused further back.

This hypothesis seems to rest upon the older assumption that the retinal percipient elements, the rods and the cones are the photochemical elements of the retina.

If we accept the hypothesis of Edridge-Green regarding vision, the influence of obliquity of the rays becomes less probable. Green suggests that the photochemical element, the element in which the light impulse changes into (probably) a chemical impulse, which is then translated into a nerve impulse, is not the rods and cones but the fluids bathing them, or possibly the retinal pigment layer which changes those fluids. This may be only one change in the whole series brought about by light in the elements of the retina. We must suppose that for the rays of light to pass through the layer of rods and cones, it is transparent, uninfluenced by the light; and not until it strikes the retinal pigment is light able to produce its essential influence.

DR. C. LOEB, Chicago (closing discussion): I do not agree with Dr. Crisp that accommodative effort is largely a matter of experience, or if it is, it is only the *amount* that is learned by experience. His theory still leaves unexplained the *reason* for the accommodative action. When a person touches a hot object he feels a sensation of pain which causes him to jerk his hand away; that is, the sensation of pain is the cause of the movement. Now, when an object is brought closer to the eye than 6 meters, something happens that causes us to accommodate. I know of no change except that of the obliqueness of the rays of light entering the eye. It may be, as Dr. Jackson states, that vision is due to chemical changes in the fluids bathing the rods and cones, or in the retinal pigment, but this does not explain the act of accommodation. Unless we suppose that the change which takes place at 6 meters is different from that which takes place when the object is at 1 meter, there would be no accommodation at the latter distance, unless something else takes place. He also states that the convergence of rays depends on the curvature of the dioptric surfaces of the particular eye, and that the rays leave the lens with a certain convergence which does not change whether it is a short or a long eye. This is true for any one position of the object. That is to say, if we have a certain amount of strength of refraction of the dioptric surfaces, the converging rays will meet the rods and cones with the same obliqueness no matter where the retina lay in front of their focus. And I have already stated that I believe there is accommodative effort even in emmetropic eye. But if the focus lies in front of the retina, as in a myopic eye, the rays diverge as they pass thru the retinal elements, instead of converging. Furthermore, in every hyperopic or emmetropic eye, the convergence with which the rays leave the crystalline lens (when at rest) varies with the proximity of the object to the eye. Although the converging *power* of the dioptric system remains unaltered, its focus recedes with the approach of the object toward the eye, and since the position of the retina is fixed, the ray which passes through any one point on its surface will be more oblique than the one which passed through it when the focus lay further anterior.

## SPASM OF THE RETINAL ARTERIES

WILLIAM H. CRISP, M. D., D. OPH., F. A. C. S.

DENVER, COLORADO.

Obstruction to the arterial circulation is commonly due either to thrombosis or to embolism; that is, to the gradual formation or lodgment of pathologic material in the lumen of the vessel. But it is probable that, in any part of the circulatory system in which end arteries occur, the blood supply may be temporarily cut off purely as the result of spasmodic contraction of the muscular fibers in the middle coat of the artery.

The important bearing of our direct observation of the retinal circulation upon a general understanding of vascular physiology and pathology is illustrated by the fact that arterial spasm was first accurately observed and understood when occurring in the fundus of the eye. Osler, discussing the occurrence of transient attacks of aphasia and paralysis in states of high blood pressure and arteriosclerosis, recognizes Peabody's priority in the rational explanation of this class of cases, as being due to the same anomalous contraction of the arterial wall as has been described in relation to the retina. A score or more of cerebral cases experienced by Osler had occurred partly in healthy individuals with high blood pressure but without signs of arterial disease, and partly in well marked or advanced cases of arteriosclerosis.

Two special disease complexes are mentioned by Osler as occasionally presenting symptoms attributable to intermittent closing of the cerebral vessels; namely, Raynaud's disease, in a case of which he saw recurring attacks of aphasia, hemiplegia, and loss of consciousness, and angioneurotic edema, a case of which in Osler's experience, in a physician aged twenty-nine years, had developed right hemiplegia and aphasia at the age of nine years, then within a year five or six attacks of transient hemiplegia, and subsequently migraine and well marked attacks of angioneurotic edema.

Langdon found that cases of spasmodic closure of the retinal arteries could be divided into the following two classes: (1) those in which the first attack occurred at or after middle life, and in which evidence of renal vascular disease was

found; and (2) a few cases beginning in early life, between eight and twenty-five years, without any other symptoms of cardiovascular disease.

Nettleship, who reported two cases, mentions as the common characteristic of cases of arterial spasm the sudden occurrence of loss of vision which continues only a short time (from a few minutes up to one or two hours), affects only one eye, and usually disappears as quickly as it came. But he adds that in some cases a final attack, instead of passing over in the usual way, leads to complete blindness.

Unfortunately, in the majority of cases the arterial change is only visualized through its symptoms and does not present itself to direct observation. The most detailed ophthalmoscopic description of a case so observed is given by Harbridge. The attacks recurred for ten days, one day as often as every forty minutes. The first attack came while bending over, and subsequent attacks followed movements requiring a bending position.

At the beginning of an attack there was gradual diminution in caliber of the inferior temporal artery, and this was rapidly followed by the same change in the other retinal arteries, until they were completely collapsed. Shortly after the arterial change, the veins underwent a similar process. The nerve head became pallid, the retina somewhat hazy. The retinal vessels looked like ribbons against the fundus. This condition continued about four minutes. Then the inferior arteries began to fill, quickly followed by the others; and lastly the blood stream was reestablished in the veins. Sight followed immediately after the filling of the vessels, although the pupil was still dilated.

The patient, a man aged forty-nine years, had suffered five years previously from attacks of vertigo that had recurred during one year. There was slight sclerosis of the vessels, and there were signs suggestive of beginning tabes. The attacks of temporary blindness finally ceased after thorough purging.

Another patient observed by Harbridge, who subsequently died of uremia, for five or six years occasionally experienced in the right eye misty vision on unusual exertion. The sight of this eye was then rapidly lost, and frequent study of the fundus after this event showed a peculiar cycle of changes in the retinal blood current. The complete cycle, which lasted about ten minutes, consisted of an interruption of the blood

current in the arteries just after they left the disc. This interruption gradually passed toward the periphery of the fundus, while a similar process in the veins passed from the periphery toward the disc. The empty blood vessels appeared as white hollow tubes of normal width. This patient was apparently free from general arteriosclerosis.

Harbridge believes that the phenomena observed in his cases may be accounted for by assuming that primarily they are dependent upon some one of the various types of arteriosclerosis. In the first of his cases here mentioned he assumes that a granulomatous nodosity of the intima of the vessel was intruded into the lumen during reflex contraction of the vessel wall. In the other case, which occurred in a person aged only thirty-one, he postulates a fibrosis of the intima leading to an obliterative endarteritis, the primary cause being some form of infection.

A man of fifty-two years who had for some time been under observation by Stölting on account of transient obscurations of vision developed such an attack while waiting in the doctor's office. The lower temporal artery appeared as a completely empty white cord, which, however, at once filled up again. The patient was an alcoholic, and suffered from mitral stenosis and insufficiency. He subsequently developed in his other eye an embolic process which resulted in a large, permanent scotoma.

In a case reported by Lundie, in a man aged eighty-eight years, there was a single attack, lasting less than an hour. The upper division of the retinal artery showed an interruption of the blood column for a distance of less than one disc diameter, as though the artery were being nipped as one nips an India rubber tube. As the attack passed off, a fine thread of blood appeared in the portion of the artery previously empty, which soon regained its normal caliber.

Van de Graaf's patient was a woman of thirty-six years who had a hematoma of the frontal region. Shortly before convulsive seizures, which were due to the pressure of the hematoma, the retinal arteries became extremely narrow; and shortly after the attacks the vessels were seen to become gradually refilled.

In Jamieson's patient, a man aged eighty-four years, the spasm apparently involved the central artery of the retina, which faded into a mere white line, this being followed closely by fading of the vein and its branches. The optic disc became

perfectly pale and white and the retina pale. The central artery became visible again in about two minutes' time.

Loss of the upper nasal quadrant of the field of vision of the right eye in Hoppe's case occurred following fright during advanced pregnancy. The lower temporal artery on the disc and for a distance of one-fourth of a disc diameter beyond its margin appeared to be absolutely empty. During a period of observation of one and a half hours, the blood column was seen at times to retreat from the disc and then return toward it. On the sixth day the previously narrowed portion of the vessel had become of nearly full width, and vision had improved. Hoppe is disposed to explain the disturbance as due to collapse of the vessel wall from temporary lowering of the blood pressure to a point where pressure could be overcome by the intraocular tension.

A sailor aged thirty-two years, whose case was reported by Benson, experienced for four years occasional transient obscurations of vision, sometimes affecting the whole field of vision, but most often only one section of the field. The frequency of these attacks increased from one a month or so to as many as two a day. During one of these attacks Benson found the largest division of the inferior temporal artery of the retina entirely bloodless for about four disc diameters of its length. After a few seconds the interruption of the blood column moved toward the periphery of the fundus, disappearing as it reached the next large bifurcation. In this attack there was total obscuration of the field of vision, and Benson remarks that probably what he saw of it was its final stage only. But on two or three further occasions on which Benson and others were able to observe the fundus during these attacks, the emptying was seen again in the inferior temporal artery. It is interesting to note that on one occasion the patient inhaled the contents of a nitrit of amyl capsule just as he felt the obscuration coming on, but as far as he could judge, this produced no effect in lessening the severity of the attack or the time that it lasted. Thorough and repeated examination of the patient by a general physician failed to discover any cardiac, renal, or other disease.

The case which I had the good fortune to observe differs, I believe, from any previously reported. It belongs to the less common class in which the patient is young and apparently free from any arteriosclerotic disease. My patient was a vigorous and healthy girl of fourteen years. In the evening

of July 5, 1920, she returned by automobile over a long stretch of mountain roads, a considerable part of which were steep, winding and rocky. She had had a large personal experience in driving, but on this occasion sat in the front seat of the car beside the driver. She told me that in such circumstances she thought she did more driving than if she were actually at the steering wheel. At 10 p. m., not long after reaching home, she suddenly noticed loss of vision in the lower half of the right visual field. She thought she had noticed something like the same condition before, when taking music lessons that she did not like, but these previous attacks were apparently only the usual scotoma scintillans and always stopped when she left the teacher's house to go home. In the present attack there were no wavy lines. She came to my office at 11:40 a. m. on July 6, and stated that the defect in the visual field was no better than when it had begun the night before.

On account of lack of time, I made a rough estimate of the field of vision with my finger as a test object, and found that, broadly, the lower nasal part of the field was blind, the scotoma being incomplete for a short distance from the fixation point, and absolute over approximately the remainder of the quadrant. Examination of the fundus showed an interruption of the blood current in the principal branch of the upper temporal artery for a distance of about one-third of a disc diameter, beginning a little beyond the margin of the optic disc. The empty part of the vessel appeared as a white band of the same width as the rest of the vessel, and cut off from the normal portions of the artery at an abrupt transverse straight line at either end. I did not observe, and do not believe there existed, any difference in color between the blood stream beyond the interruption and that of the normal artery.

The patient was seen again three times in the course of the next two days. My history of the subsequent development of the condition is unfortunately not so detailed as could be wished, for the patient was difficult to keep in touch with. She paid relatively little attention to the eye disturbance, did a lot of automobiling with young friends while in town, and after a few days went out of the city, so that I did not see the eye for two weeks. A systematic field chart taken on July 8 was broadly in agreement with the first rough measurement. The interruption in the blood stream showed no change during the three days in which she was under steady



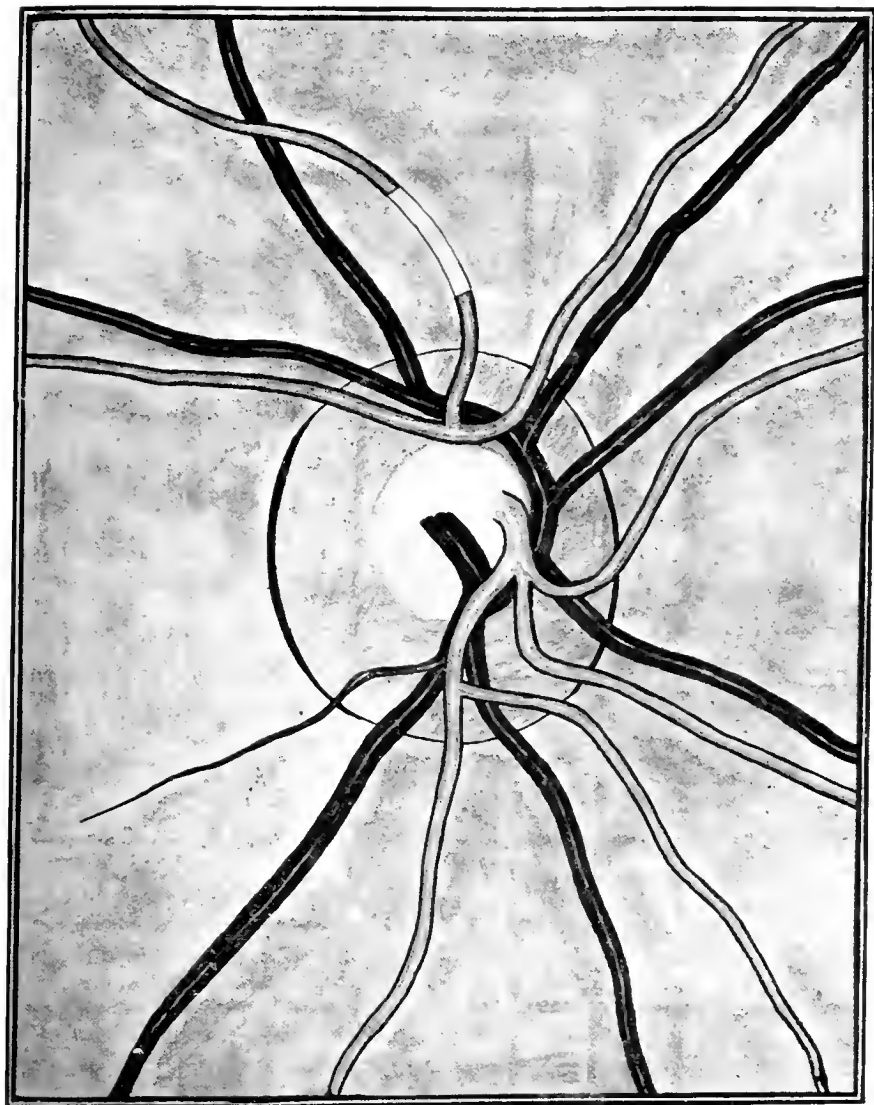


Fig. 1

observation, and after rather more than two weeks was only partially restored, the vessel at this time appearing as two blood columns of normal width connected by a much narrower red strip. This appearance lasted until the latter part of July. During August and most of September I saw nothing of the eye. The field was again charted on September 22, and its appearance at that time is illustrated. There was a

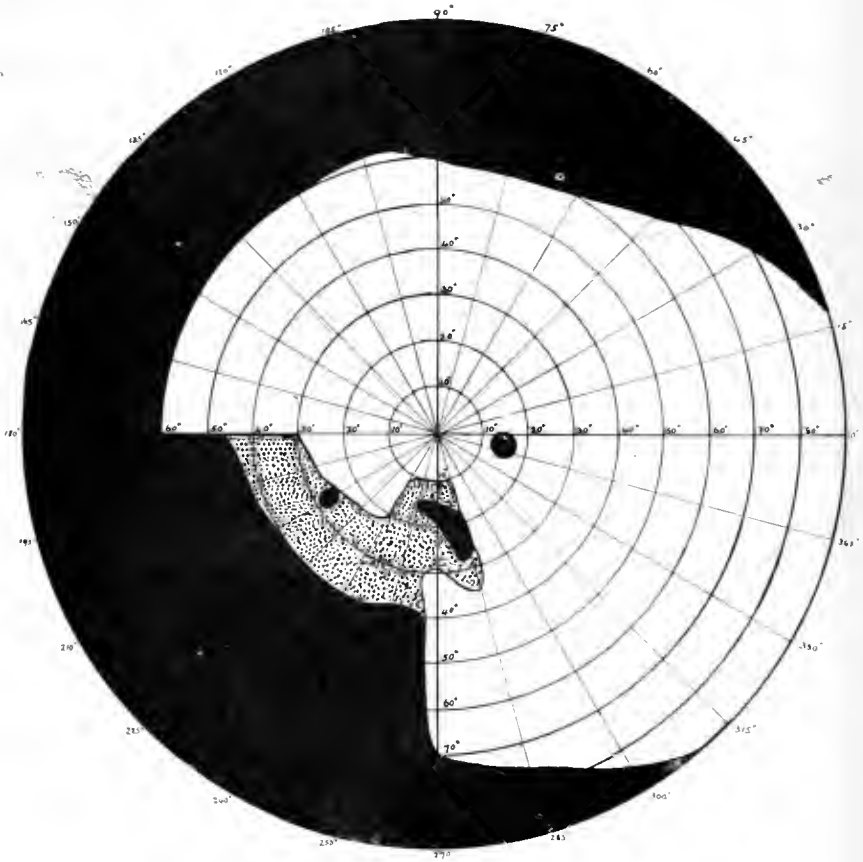


Fig. 2

broad area of complete blindness covering about the outer twenty degrees of the normal lower nasal field. Internal to this was an irregular strip covering from fifteen to thirty degrees, in which the test object was seen indistinctly. This indistinct area, and an irregularly oval-shaped complete scotoma which was included within it on the vertical line at from fifteen to twenty-five degrees below the fixation point,

extended over into the lower temporal quadrant for about ten degrees. There was another small absolute scotoma within the indistinct area along the two hundred and ten degree meridian at between twenty-five and thirty degrees from the fixation point. A marked natural restlessness on the part of the patient during any form of examination made exact accuracy in detail difficult.

Central vision of the affected eye has at all times been absolutely normal. The patient's blood pressure, taken on several occasions, measured in the neighborhood of one hundred and ten millimeters of mercury. Her family physician, Dr. John Inglis, reported the cardiac and renal condition as entirely normal.

The study of these cases of spasm of the arteries is an extremely interesting one, and, as with a good many other eye conditions, tantalizing in the obscurity of its anatomic foundation. The only plausible explanation which has been advanced is that of spasmodic contraction of the muscular coat of the vessel. Spasm is presumably due, as in the case of the ciliary muscle and accommodation, to either excessive irritation or excessive irritability, or both. In my patient, the retina was undoubtedly subjected to an excessive amount of irritation. Excessive irritability was present in the high-strung nervous system of the patient. In prolonged and intense ocular fixation, especially of rapidly moving objects, the winking reflex is to some extent inhibited, so that the retina is deprived in part of its normal opportunity for rest. Increased use is followed by increased circulation of the blood in the part. The mechanism of increased blood supply includes on the one hand dilatation of the blood vessels, and on the other hand an increase in what may be called the peristaltic movement of the vessel walls. Every small bundle of unstriped muscle fibers in the artery no doubt receives its impulse to contraction from a special nerve ending or group of nerve endings. It is conceivable that excessive innervation, a sort of local flooding with nerve force, of a particular stretch of muscle in the middle coat of the artery might result in persistent contraction without the subsequent relaxation which normally should occur. To inquire why that particular stretch of muscle fibers should be selected for overstimulation is perhaps as futile as to wonder why lightning may kill a horse and spare its rider.

Another question to which I can offer no answer is as

to why, if the empty strip of blood vessel which I observed was caused by a spasm of the muscular coat of the vessel, did the empty part of the artery appear of normal width? Furthermore, if the color of the retinal arteries is due to the viewing of the blood through a transparent arterial wall, why did the empty blood vessel appear white instead of transmitting the normal diffuse ruddy tint of the eyeground? A medical friend suggests that there may have been an isolated perivasculitis, but I feel that this is unlikely.

I believe it is fair to suppose that not only this case of arterial spasm but many other accidents to the retinal circulation may be excited by excessive strain upon the retinal and accommodative functions, with the resulting hyperemia and vasomotor overstimulation; especially when we consider that these excesses are often merely part of a general agitation of the central nervous system.

#### DISCUSSION

DR. GEO. F. SUNKER, Chicago: Spasm of the arterial vessels of the retina is exceedingly interesting, and I wish to speak of my own individual experience, especially with reference to migraine as associated with the scintillating scotomas and the scintillating types of migraine. The scintillating scotomas you frequently get in migraine are due to a true spasm of the retinal blood vessels transmitted beyond their terminus into the veins. I have been a subject of migraine for thirty years or more, but am out of it now, being sufficiently old, and age is the only natural and efficacious cure. A confrere of mine often saw these retinal vessel spasms with the ophthalmoscope. They always commenced in the right eye, nasal field, and afterwards passed over to the temporal and then passed over into the left eye from right to left. He could see that the corresponding retinal arteries were exceedingly contracted and the veins engorged and he could see them contract in a worm-like action, and in ten or fifteen minutes after the scintillating scotomata appeared in the right eye, I would have a temporary blindness for a few moments. Then as the right eye recovered, the same symptoms would appear in the left.

We must differentiate this spasm from the normal arterial pulse, which is now and then seen in the fundus and often extends to the periphery. That is a spasm also, but it does not irritate the retina sufficiently to cause any visual sensations. These spasms do not last sufficiently long to cause permanent blindness, though it is dependent upon a temporary retinal anemia. It is most likely due to a toxic affair and is an irritation brought about by toxins of some sort stimulating the ocular sympathetic nerve supply.

The scintillating scotomata of migraine are certainly fantastic and bizarre and I trust no one else here may have anything like I did. The amnesia and aphasia are due to momentary spasms in the cerebral vessels in Broca's center.

DR. G. E. DE SCHWEINITZ, Philadelphia: It may be interesting to state that through the courtesy of Dr. Harbridge I had the opportunity of studying one of his cases of "spasm of the retinal arteries" during an "attack." There was complete collapse of the retinal arteries, followed in four minutes by restoration of their caliber. Although the late Dr. Coats maintained that "there is at present no proof that obstruction may be caused by spasm apart from endarteritis," the effect of a spasm from the clinical standpoint must be conceded. During attacks of migraine and epilepsy intermitting spasm of the retinal arteries has been recorded. Doubtless, as Dr. Suker has said, a circulating toxin may be regarded as the causative agent, or at all events, a toxic influence; even excessive use of tobacco has been accused in this regard. Periods of temporary blindness lasting from a few minutes to an hour may precede ultimate obstruction of the central retinal artery, or one of its branches. The "obscurations" may occur at intervals for months or even years before the final block takes place.

DR. W. H. CRISP (closing discussion): It is usual to think of spasm of the retinal artery as being an accident that does not result in permanent obscuration of vision. But although the case which I am reporting can not, I believe, be classified otherwise than under this heading, the accident has in this case resulted in a permanent disturbance of the patient's vision. I quite agree that we must look to some toxic condition to explain the spasm, although the exact mechanism of the irritation is hard to fathom. In my patient I believe that the nervous fatigue from which the girl undoubtedly suffered was probably the foundation of such a toxic disturbance. I was interested in Dr. Suker's discussion of the scotoma scintillans of migraine, and we probably do have a slight vacular spasm in this condition somewhere back in the brain, but in my patient we are dealing with a strictly localized spasm in a vessel of the retina.

## BILATERAL CIRCUMPAPILLARY CHORIO-RETINITIS WITH DETACHMENT OF THE RETINA IN SYPHILLIS

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The following case of retinitis is of interest on account of its circumpapillary distribution, and the complicating detachment of the retina which was cured by antisyphilitic medication.

*History:* J. K., Japanese, aged 26, came to the Herman Knapp Memorial Eye Hospital on February 7, 1920, stating that nine days ago his vision had begun suddenly to fail in both his eyes. He had always been well except for headaches and had generally been constipated; two weeks prior to the loss of vision he suffered from severe frontal headache.

*Examination of the Eyes:* February 13th, vision 3/200. The field shows a defect occupying the upper half, and a well marked, irregular, central scotoma.

Slight ciliary congestion, corneae clear, pupils dilated irregularly to atropin. The eyeballs are unusually soft, the intraocular tension in the right eye is 12 (Schiötz), and in the left 10. The discs are blurred and congested; the margins are ill-defined. The veins show some tortuousness, the arteries are normal. The fundus picture is striking on account of retinal edema like that observed in closure of the central retinal artery; the color is not white but is distinctly green. This greenish discoloration extends well into the periphery. The retina around the optic nerve is raised like a wall measuring +2 D. with the ophthalmoscope. In the lower part of both eye-grounds there is a very large retinal detachment.

A careful *general examination* by Dr. W. W. Herrick shows patient to be well nourished, skin dry, one fistulous opening in the gum above the upper central incisor tooth, thyroids small, superficial lymph nodes not enlarged except in inguinal region; lungs, heart, abdomen negative; urine negative; blood count normal. The Wasserman test is 4+. The stools contained a large number of active motile, flagellate organisms. These were examined at the bacteriologic laboratory of the College of Physicians and Surgeons and the organ-

ism was regarded as the *trichoma hominis*, a parasite which is found frequently in the tropics and is of no significance.

The patient was given mercurial inunctions, calomel by mouth and neosalvarsan injections; atropin eye drops and sub-conjunctival salt injections.

February 18th: Slight ciliary congestion. There is more exudation and more congestion in the retina. A line of exudate passes up and down from the disc in the retina.

February 23rd: The edema of the retina is somewhat less and in the upper periphery the reflex is more pink. The detachment is perhaps somewhat greater; there are no hemorrhages; tension very much reduced; vision 4/200; nystagmus.

February 26th: Vision the same; optic discs more congested. There are a few hemorrhages in the right eye; the periphery in the eye ground is pink.

February 29th: Vitreous slightly clouded. While the optic nerve is not swollen, the surrounding retina is very distinctly elevated, measuring +2 D. The veins are full, the arteries show no disease to the ophthalmoscope. The detachments have enlarged and nearly approach the disc.

March 7th: More ciliary congestion; pupils medium; some corneal deposits; the retina is more normally red; the left optic nerve shows more congestion.

March 12th: Vision improved to 8/200; the fields have enlarged and the eyegrounds are clearer.

March 14th: Vision R. = 14/200, L. = 10/200. Right eyeground much clearer, pupil dilated, eye is white, the detachment is distinctly smaller and flatter. Retina is pink; circulation is better though the veins are still broader than the arteries. The optic nerve is defined and pink. In the left eye there is some retinal exudation, especially on the nasal side of the disc, with a fresh hemorrhage up and in.

March 19th: The right eye is clearer. The detachment is less. The left optic nerve still shows some blurring.

March 21st: R. = 15/200, L. = 12/200. Field enlarged. The tension is better, though it is still softer than normal. There is some ciliary congestion.

March 25th: Vision R. = 20/100, L. = 20/200. Pupils are dilated. Eyeground is clearer; the detachment is much shallower; there are some dark areas in the retina.

March 29th: The retina has lost its green appearance and is again transparent. There is no swelling to be seen. Some

congestion of the vessels; detachment shallow. Vision R. = 20/100, L. = 20/200.

April 11th: Vision R. = 20/70, L. = 20/100. Eyes are white, pupils dilated, some peripheric adhesions of iris; vitreous clear, tension normal. The optic nerves are distinctly blurred: some venous congestion; arteries show no abnormality; eyeground pink; some slaty gray areas in the retina but no choroidal involvement visible; right, peripheric shallow detachment.

The patient then disappeared from view until July 2nd; no treatment had been followed in the meanwhile. Vision is now 20/30 in each eye. Field and tension normal. The eyes are white, pupils round, about 4 mm. in diameter, not reacting to light, slight contraction on convergence. The vitreous is clear. The optic nerves are pink with slightly blurred margins, the arteries show no particular disease. The eyegrounds show the changes of diffuse chorio-retinitis, choroidal atrophy with choroidal and retinal pigmentation. There is no detachment. The Wasserman test is 2+; the spinal fluid is negative.

Diffuse syphilitic retinitis presents a very definite clinical picture. It is one of the few characteristic clinical pictures of syphilis and was first described by Jacobson and then carefully studied by Förster. The opacity of the retina most marked at the margins of the disc and along the course of the large vessels, diminishes gradually towards the periphery and the disc is not prominent. There are no exudates or hemorrhages and characteristic dust-like vitreous opacities are usually present. The retinal vessels on careful inspection sometimes show delicate white lines.

A subdivision of this condition has been described as *circumpapillary retinitis*. The opacity and swelling of the retina are so marked as to form a wall around the disc, which, however, is not included in the general swelling. The reason for this localization of the exudate to this part of the retina about the disc is not understood, as no pathologic examinations have been made, but is probably due to an anatomic cause.

Dufour and Gonin<sup>1</sup> describe a bilateral case in which the swelling of the retina was so great as to appear in folds in the macular region. The opacity of the retina was just as noticeable as in obstruction of the retinal artery, but instead of a milky color the fundus presented a greenish-gray tint with white, tendinous reflexes. The retinitis occurred three to four years after infection and followed an iritis.



This is the only case which I could find in the literature where the greenish tint was observed similar to the case described in this paper. The green color, to my mind, is due to the presence of an albuminous substance in the inflammatory exudate situated in the deeper layers of the retina.

The retinal blood vessels did not show any obstruction and perivascular changes were not observed. The transition of the ophthalmoscopic picture to a chorio-retinitis pigmentosa in a relatively short time (four to five months) is unusual. The opacity of the retina sometimes persists for years, and the pathologic progress is usually so slow that its termination in chorio-retinal changes is rarely observed in the same patient, though Leber<sup>2</sup> says that this transformation in the ophthalmoscopic picture is quite definite. The symptoms in my patient were so active and the treatment so intensive that the course was unusually accelerated.

A very interesting and ominous complication in this case was the bilateral detachment. Detachment of the retina in syphilitic retinitis is very unusual. Uthoff, in speaking of the value of antisymphilitic remedies in treating detachment of the retina, says that though detachment of the retina in syphilitic retinitis is mentioned by several older authors (Galezowski, Hirschberg, Prouf, Gillet de Grandmont) he has never observed a case. This complication is not mentioned by Leber (Graefe-Saemisch-Hess) or by Igersheimer (Auge und Syphilis). As is well known, detachment of the retina occurs in nephritic retinitis, especially in the more acute forms and in severe cases. It is generally bilateral and Leber found in sixty cases, twenty-five occurred in the retinitis of pregnancy and thirty-five in other forms of nephritic retinitis. The detachment is quite different from the ordinary detachment as it is distinctly an exudation presumably from the choroidal vessels and not due to a retraction process from within, according to the teachings of Leber-Nordenson. Furthermore, tears in the retina are absent, and the readiness with which the retina reattaches in these cases is a striking proof of the dissimilarity of the process.

The tendency to slight ciliary congestion, the difficulty of dilating the pupils with atropin and the unusual hypotony in the case described in this paper suggested an early interference with the function of the ciliary body. This, in turn, led to increased transudation from the vitreous and favored exudation from the choroidal vessels with the development of

circumscribed detachment of the retina, which subsequently was cured as treatment progressed.

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#### DISCUSSION

DR. HARRY GRADLE, Chicago: Dr. Knapp must have read Dr. Jackson's paper before he came in, that he rids his case of all detail. He was kind enough to send the paper to me and I had a chance to read it beforehand. There are several questions I would like to ask. The green color referred to I have never seen explained satisfactorily, and I will ask if he will explain why there is in this particular form that distinct green color. Then again, is it not possible that the detachment was due to the force of gravity, and that brings up the question of location of the exudate. The exudate was partially intraretinal and partially retrolental. Why should the retina alone be involved to such an extent that it formed practically the mouth of a well around the optic nerve head? Of course the retina around the nerve head retains a great deal more exudate when of this fluid character than the rest. The retinal currents flow by the nerve head, but why should these not have passed on with the nerve fibres and caused a distinct swelling of the nerve head, possibly up to the plane of the surrounding retina? The details of the case are extremely interesting and extremely rare, and I am sure when we do run across a case like this we will have no difficulty in recognizing it from Dr. Knapp's careful description.

DR. F. PARK LEWIS, Buffalo, N. Y.: In making tonometric observations I have noted that the readings when the instrument is placed over the cornea differ materially from when taken over the sclera. This is especially noticeable in choroidal disease in which the scleral pressure is often not only markedly reduced, but varies in different parts of the globe.

As the thinning of the sclera occurs under such conditions this is not surprising.

Is it not possible that tonometry may prove to be a valuable aid in determining the scleral resistance and the consequent progress of degenerative changes in choroidal disease.

DR. KNAPP (closing discussion): I think the greenish hue is due to the admixture of albuminous constituents in the exudate. Everyone is familiar with the different colors of detachments, pink, white and sometimes blue or greenish. The exudate is situated not only in the deeper layers of the retina, but is also subretinal; and I agree with Dr. Gradle that the exudation is probably at the beginning all around and probably sinks down from gravity to the lower part of the eyeball.

## CONSERVATION OF THE LACRIMAL SAC. A METHOD

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The object in presenting this subject is to briefly review some of the anatomic and other underlying principles of etiology and treatment of lacrimal obstruction in an endeavor to arrive at a further solution of a common ophthalmologic problem.

Consideration of the methods (and numerous modifications of methods) of treatment for stenosis of the nasolacrimal duct convinces one that, although the problem is not satisfactorily solved, the reasons for failure of various methods are being overcome; also, that much progress is being made, as evidenced by the direction of effort looking to preservation of the lacrimal sac and re-establishment of drainage instead of extirpation of the sac. Too often, we fail in the treatment of lacrimal diseases because we consider them primary conditions and overlook, or neglect to examine for, the real causes of lacrimal disease in some existing nasal pathology or anatomic abnormality of the duct itself.

Very often lacrimal obstruction is the result of congestion of the venous plexus in the lower extremity of the duct associated with hypertrophic rhinitis and its causes. Hypertrophy and malposition of the turbinates, polyps, chronic infection in the paranasal cells, or membranous defects in the distal end of the lacrimal canal should be sought for and remedied. The association of chronic dacrocystitis and lacrimal phlegmon with ethmoiditis should be, but is not, fully appreciated. That nasal conditions instead of conjunctival infection, with the exception of trachoma, largely predominates in the causation of lacrimal disease is best proven by the freedom from lacrimal involvement in the numerous conjunctival infections when anatomic conditions are normal. Any treatment directed to the lacrimal structures themselves which fails to take into consideration the associated nasal causes will lead to failure. But when the anatomic conditions are normal and the nasal condition can be remedied, simple treatment and intelligent use

of probe and syringe will reestablish normal drainage in many cases.

Too little consideration has been given to the anatomic defects causing stenosis of the duct.

As Schaeffer<sup>1</sup> says, "the plane of the nasolacrimal canal must conform to the plane of the facial skeleton, is rarely vertical and the thickness of the bone between the duct and the maxillary antrum varies from papery thinness to 2 or 3 mm., at the juncture of the sac and duct in most instances, although no arbitrary division between duct and sac is usually perceptible." Also, "instead of merging in linear fashion, the sac and duct may frequently be found joined side by side in an indirect continuity, the fornix of the duct lying at the side of the sac." Again, "it is generally believed that the walls of the duct are always regular, and the larger number of ducts *do* have regular and uniform walls with minor irregularities due to mucous membrane folds, but many ducts present lumina of very irregular contour, some are exceedingly tortuous in course, while congenital diverticula are not uncommon." He suggests the clinical importance of these anomalies in that they readily retain infectious material, are the true explanation of the false passages made in using the probe, and contribute to the chronicity of pathologic conditions of the lacrimal sac and duct.

To these should be added the anatomic causes produced by facial deformity as in congenital lues, those caused by fractures, or from pressures with congestion and infection caused by diseases of adjacent parts. These conditions afford ample explanation for the frequent stenosis of the duct, which, in the vast majority of instances, is the cause of the interference with lacrimal drainage and its attending results.

Conservative treatment with lacrimal probes and syringing will assist in the cure of, and sometimes actually cure, recent cases in which marked thickening of the sac walls has not occurred and in which stenosis is slight, but treatment by probing should cease as soon as two or three attempts have been found ineffectual. Systematic probing can not be well done without slitting the canaliculus, which act itself aggravates the tendency to epiphora.

The desirability of preserving the canaliculus intact, especially the lower canaliculus, is very great on account of need of preservation of the natural capillarity and suction mechanism

at the proximal end of the passages. Slitting the canaliculus often nullifies the otherwise good results of dacrocystorhinostomy operations with perfect openings into the nasal fossa. When tears reach the sac, natural gravity is sufficient to secure drainage providing the nasolacrimal duct is not obstructed.

Constant epiphora caused by stenosis of the duct, and especially if it be accompanied by suppurative dacrocystitis and pathologic changes in the mucosa can rarely be cured by probing. Violent effort to effect a passage practically always results in increasing the chronicity of the original condition by producing false passages, causing fracture of the thin maxillary wall of the nasal canal or increasing the congestion of the venous plexus of the duct. Probing is wrong in principle in many of the cases encountered because of the anomalous conditions so frequently present just mentioned. Unfortunately, there is no means of knowing what type of duct or canal or what conditions exist within the membranous canal until a sound is passed.

The extreme thinness of the bony wall of the duct which lies practically within the wall of the maxillary antrum in most skulls is the best argument against the use of exceedingly large lacrimal probes. The larger Theobald probes and even the 3 mm. Ziegler probe must fracture the bony canal when their diameter exceeds that of the canal itself.

Likewise, the value of the lead style is overestimated. It is of use only for patients who refuse better treatment by operation or in those living at a distance who can be seen only occasionally. It is useless in suppurative dacrocystitis.

The ultimate treatment of chronic stenosis of the nasal duct and of all chronic dacrocystitis, providing the patient has not become discouraged by temporizing, previous ineffectual efforts and painful probing, must be operative. Decision as between extirpation and surgical transnasal drainage must be determined by the state of the sac itself, the degree of obstruction encountered, the existence of nasal pathology, and the emergency conditions met with in each particular case.

The indications for removal of the lacrimal sac as given by Meller<sup>2</sup> are: chronic blennorrhea or mucocele with markedly thickened sac walls, total obstruction of the nasolacrimal duct, or fistula; when an operation necessitating opening of the globe is required; in *ulcus serpens* or other purulent infection of the cornea in which there is constant reinfection from the

sac, when prolonged treatment with sound is impossible or when probing has not effected results.

Most of us will agree that operations upon the globe, and purulent infection of the cornea, associated with a suppurative infection of the lacrimal sac, make extirpation desirable and, in most cases, imperative. In tubercular or lupoid involvement, in polypoid disease, incurable fistula or malignant growth, in certain cases of trachomatous infection and atrophy of the sac, or in some cases of perilacrimal disease from caries of adjacent bony structures, extirpation is clearly indicated; also, possibly in ozena, extirpation may be preferable to any of the short-circuiting operations.

All ordinary stenosis of the naso-lacrimal duct which can not be relieved by other simple conservative means and all suppurative dacrocystitis except those just mentioned, in the absence of emergencies, demand our best efforts for the restoration of function and preservation of drainage.

Most of us living in northern latitudes, at least, have discovered the fallacy of the oft quoted dictum that after extirpation lessened reflex activity of the lacrimal gland results and epiphora will cease. The infection is often abolished, but lacrimation continues and is almost as conspicuously annoying after, as it was before, removal of the sac. Even though the palpebral gland be resected, under favorable weather conditions tearing persists. Moreover, on account of hemorrhage or faulty technic we fail occasionally to remove the sac in toto and secondary operations are required to remove remnants of mucosa or to destroy the canaliculi which become blind tubes and retain infection.

The operations of Toti, West, Yankauer and others with the various proposed modifications are, when indicated, successful in accomplishing practically all that can be claimed for extirpation. These operations or their modifications are being accepted with increasing favor with cumulative experience. All are alike in principle and vary only in technic. Many of the failures following efforts at dacrocystorhinostomy are either due to splitting of the canaliculus improperly or unnecessarily done or purely to technical difficulties. The latter often arise from inexperience with nasal surgery.

The anatomic relations of the bony lacrimal passages to the adjacent nasal structures are of importance in determining the choice of routes between the nasal fossa and the lacrimal

fossa and perhaps explain the reasons for closure of new openings made.

Onodi<sup>1</sup> and Schaeffer<sup>4</sup> emphasize the intimate relationship of the lacrimal fossa and duct with certain of the anterior ethmoid cells which are found lying as far forward as the anterior limits of the fossa and duct at times. Numerous specimens are reported in which the frontal sinus has pneumatized into the frontal process of the maxilla. Benedict<sup>5</sup> has recently discussed the clinical association of ethmoidal disease and dacrycystitis. Whitnall<sup>6</sup> in an examination of 100 skulls, found the superior half of the lacrimal fossa in relation with the ethmoid cells in every specimen examined, in fifty-four instances the cells extending completely across the fossa.

The upper nasal wall of the lacrimal duct is the most apt to be free from involvement with the paranasal cells and in this region the bone is practically always one thin layer until it reaches the level of the turbinate. At this site it can be penetrated as easily as it can higher up beneath the lacrimal fossa. All of these facts have been verified by the writer by the examination of many skulls and wet specimens.

Any attempt at short-circuiting lacrimal drainage high into the nasal fossa must involve destruction of ethmoidal cells in most instances, and one must penetrate two lamina of bone between the nasal fossa and the sac, whether operating by the endonasal or the external route.

Where two layers must be penetrated, with cells between, granulations develop more readily than when one clean cut through the bone is possible. One only needs to study the plates which especially illustrate this point in the textbooks of Loeb, Onodi, Schaeffer and others and then measure a series of skulls and wet specimens to amply verify the practical points mentioned.

With these facts in mind it can readily be understood that the opening least liable to closure and freest from nasal complications lies in that portion of the nasal wall of the nasolacrimal duct just below the sac, above the inferior turbinate.

By the modifications of the West operation proposed by Prince,<sup>7</sup> or better still, by the method offered by Wiener<sup>8</sup> and Sauer, one can limit the nasal involvement to a fair degree and feel certain of cutting down directly over the sac.

In order to reach this point by the *external* route it is necessary to chisel away the anterior lacrimal crest slightly over the duct. A very practical point gained in operating by

this route is the possibility of utilizing a portion of the nasal duct itself for drainage and as a lining for the bony opening by following the technic described later.

The endonasal operations offer a distinct advantage in the possibility of drainage when phlegmon of the sac is present and absence of external scar.

The objections to the endonasal route are that it involves nasal surgery which may be avoided and must sometimes be done solely for the purpose of obtaining a better working field.

Submucous resection of the septum, resection of the anterior ends of the inferior or middle turbinates, the unciform process or in some cases even the pyriform process, are necessary when there is obstruction caused by abnormalities of these parts and a good view of the field is not otherwise easily obtained. A mucous membrane flap is required and one is not certain of the exact landmarks in every instance, especially the so-called *torus lacrimalis* described by West. It is distinctly a rhinologic operation unsuited to ophthalmologists, but this is not a real objection if the rhinologist can do it better.

The only disadvantage of the external route is the scar. Its simplicity, a full view of the operative field, easier access to the nasal fossa through the bone at the logical site, with less probability of penetrating the ethmoidal cells or antrum, make the external route a distinctly advantageous one.

Moreover, there is far less traumatism of the nasal structures and little likelihood of adhesions, while by a modification of Cirincione's method the proximal end of the nasolacrimal duct may be utilized, thereby lining the bony opening with mucosa, avoiding a cul-de-sac and shortening the aftertreatment.

It has frequently been asserted that probing and syringing of the sac are required after the West, Toti, Mosher, and other short-circuiting operations. This is true in most cases, but the probing or syringing is practically painless.

The results by either the intranasal or external operation are apparently about equal, each has its proponents, and the question resolves itself into which method is easiest to do, many ophthalmologists preferring extirpation to either, though readily admitting the advantages of preservation of function of the tear passages.



A modification of the Cirincione, Toti and Kuhnt operations which has been successfully used by the writer is as follows:

Under ether given by tube, a crescentic incision about 3 cm. in length is made beginning just below the internal palpebral ligament and extending directly over the lacrimal crest, horizontally well beyond the opening of the bony lacrimonasal duct. All tissues on the median side of the sac and over the crest should be incised down to the periosteum. The sac including the periosteum is undermined from its anterior median wall (not as in Toti's method from the posterior lacrimal crest forward) separating it from its fossa down to the beginning of the duct. On its orbital side, the sac is not entirely dissected free from the fascia covering it, although it is freed entirely from the fossa as high as the internal ligament to allow of free retraction.

With a lacrimal probe in the sac, the *duct* is freed by careful dissection and separated from its bony canal in its entire circumference downward for a distance of 5 or 6 mm. This is accomplished by the use of Steven's long pointed tenotomy scissors and a thin, flattened, blunt-pointed probe.

Retracting the duct and sac as far to the orbital side as possible permits cutting down the thickened anterior lacrimal crest over the beginning of the canal. This is done with a burr or biting forceps over the duct, and the crest may be chiseled down in layers, until a trephine can be used. The duct, being dissected free, is then incised with scissors *from the median side obliquely downward*, and lifted from its canal, which is packed with adrenalin and later cauterized.

It will be found that before the duct is incised, after the lacrimal crest has been cut down, the freeing of the duct can be carried a little further down the canal than before. The sac and duct are now turned upwards and the sac is further freed from its fossa upward, both sac and duct then being retracted well upward and outward to permit making the bony window.

For this purpose a burr may be used, although a 5 mm. dental trephine was used by the writer very easily, the bony opening including part of the crest and lacrimal sulcus anterior to where the superior maxilla unites with the lacrimal bone and as far below it as one can reach. The window thus made should lie almost entirely in the nasal process of the superior maxilla and really include very little of the lacrimal bone itself.

If this site is adhered to, no perforation of the antrum can occur, and there is little likelihood of encountering ethmoidal

cells. Protecting the septum with a thin broad submucous dissector or septal clamp, the nasal membrane is incised at one border of the ring with a Graefe knife, held with a fixation hook and the nasal membrane resected through the bony ring. Bleeding is controlled with a nasal tampon and adrenalin if necessary.

A small Hajek or Miles punch is used to cut away the nasal wall of the duct still further downward if desired, but this must not be carried below the level at which the duct has been cut across and never below the upper border of the inferior turbinate.

(The Morax lacrimal punch, which is similar in principle to a leather strap-punch, may be used entirely in making the window into the nasal fossa. A modification of the Morax punch is now being made which it is hoped will do away with the trephine entirely and expedite the making of the opening into the nasal fossa.)

*Very little* of the median wall of the lacrimal fossa should be cut away and *none* of the sac should be excised. The duct is slit on its nasal side from its lower end upward into the sac for a short distance, and duct and sac are tucked through the opening in the bone:

If the canaliculus has been split previous to the operation, large Theobald probes are passed until a 4 mm. soft rubber catheter can be passed freely through the sac, duct and new nasal window into the nose. This is cut off above and strapped to the forehead. If the canaliculus has not been previously split, a lead style is similarly used. The purpose of the catheter or style is to aid in holding the duct in place in the bony window until healing has taken place. The skin incision is closed with horse-hair sutures, a small gauze drain being left at the lower end of the incision opposite the upper end of the duct. This must be protected with thin rubber tissue at the end in contact with the duct in order that its withdrawal will not pull the duct back from its bony window.

The lead style or catheter is left for one week, or longer when possible, and when removed the sac is irrigated, being cleansed at intervals of two or three days for a few weeks afterward. The operation described has been done but three times and in two of these patients the canaliculus had been previously opened, making the use of a small catheter easy. In each case there was little troublesome hemorrhage, the operation was not difficult or tedious, and the opening remained

patent entirely in two instances. No nasal treatment was required, and the incision scar was inconspicuous.

The advantages claimed for the method described are:

It is the least difficult of all the cystorhinostomy operations, is suitable for those not accustomed to intranasal work and is directly under the eye.

There is no danger of involvement with any of the sinuses, less probability of granulations forming because of the thin bony window wall and the low site at which the window is made and the absence of nasal membrane flap.

A mucous lining for the bony window is provided by use of the lacrimal duct, none of the sac is sacrificed and no cul-de-sac is left wherein infectious material can collect. There is the least disturbance of the nasal mucosa and little or no after-treatment is required.

If the technic described is closely followed, utilizing as much of the slit duct as can be obtained, I believe fewer closures of the opening will result than by any other method hitherto described.

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## LACRIMAL SAC EXTIRPATION SIMPLIFIED

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The title of this paper indicates that no attempt will be made to bring forward a distinctly new operation, but to bring to the attention of Ophthalmic Surgeons a description of the various steps in performing a most simple and speedy operation for the location and removal of the lacrimal sac. The method to be described has been used by the author for the past twenty years and has always been found satisfactory. Two reasons have made it advisable to give a description of this method: first, a careful perusal of the text-books on Ophthalmic Surgery and the chapters devoted to operations in regular Ophthalmic text-books has led to the feeling that a more concise outlining of a simple method for such an operation was very timely, secondly, during the past ten years that the author has been giving courses in surgery of the eye to postgraduate students at the Harvard Medical School, it has almost invariably been found that these men had been attempting this operation by the usual slow method of dissecting, layer by layer, to find the sac, with the frequent mischance of opening into the orbital fat, or of so injuring the sac as to make it difficult to remove it totally and most of them have said that they were loath to attempt an extirpation of the lacrimal sac on account of the many difficulties which they met when following the usual prescribed methods.

The author is greatly indebted to his confrère, Dr. Walter B. Lancaster, for his kindness in loaning pictures to show with the description of this operation. Dr. Lancaster has, for many years, been independently following the same plan of procedure, with equally satisfactory results.

No attempt will be made in this article to differentiate cases that should best be operated on by extirpation from those that could be operated on through the nasal route or best be treated by some conservative methods, or destroyed by caustics.

It is taken for granted that in any case of disease of the lacrimal sac sufficient study and preliminary work shall have been given the case so that the operator has finally decided upon extirpation as the best operation for the individual case. Having thus decided he comes to the choice of operative methods.

A glance at the anatomy of the bony lacrimal fossa and the surrounding parts will help us to a clearer understanding of the procedures described. As Col. Elliot well puts it, "the guide throughout the operation is the lip of the lacrimal fossa."

The first illustration gives a diagrammatic picture of the tear sac and duct and illustrates how far above the entrance of the canaliculus the dome of the sac extends.

Number 2 (a horizontal frozen section) gives a very clear idea of how well the lacrimal sac is protected in the fossa.



Fig. 1

Number 3 shows very well both the anterior and posterior lacrimal crests which outline the lacrimal fossa and also illustrates the fact that the fossa is made up partly in the nasal process of the superior maxilla and partly in the orbital portion of the nasal bone.

Number 4 shows the arteries and veins in this region and illustrates how necessary it is to follow close to the lacrimal crest and not to get too far above the triangular ligament in order to avoid cutting the main vessels.

Number 5 shows the nerve supply and clearly indicates points most suitable for the injection of novocain in the method of extirpation of sac with local anesthesia. In this illustration one also sees well marked the attachment of the upper and inner por-

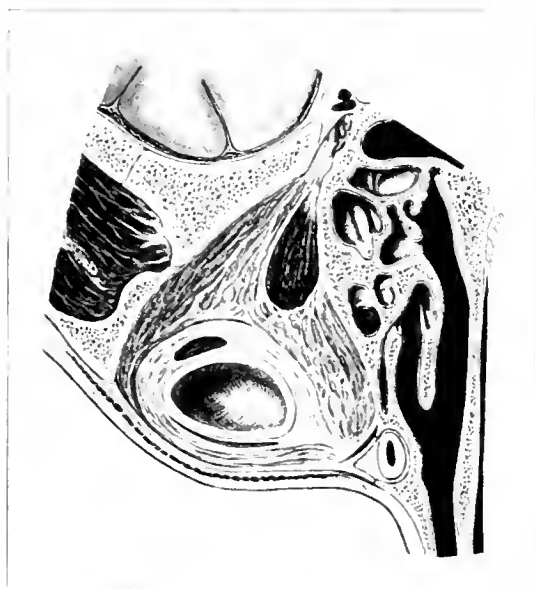


Fig. 2



Fig. 3

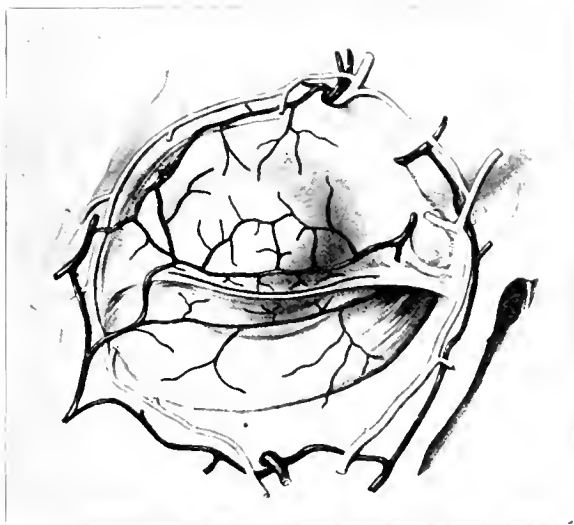


Fig. 4

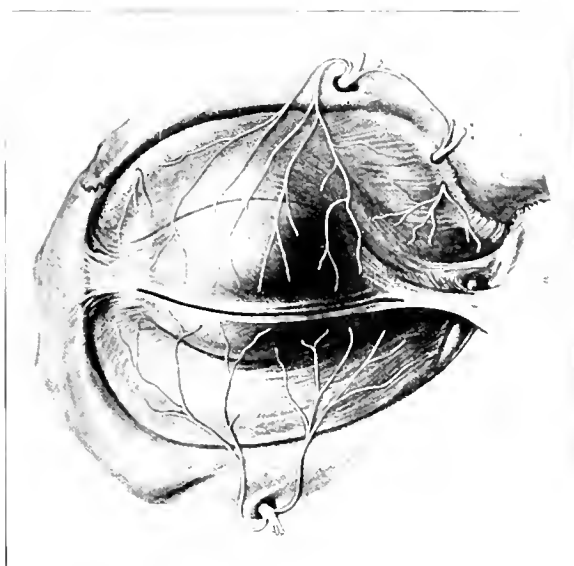


Fig. 5

tion of the triangular ligament to the upper part of the posterior crest, thus allowing ample anchorage for the inner canthus even if the anterior portion of the triangular ligament is cut. The author has never seen any bad after effects from cutting this anterior portion.

The patient is prepared as usual for such an operation and general or local anesthesia brought about. Local anesthesia is becoming more and more the custom, however. Prior to making the incision it is well to place a strip of adhesive plaster across the closed lids over the eye on the side to be operated on. It is then the author's custom to outline on the skin with the finger nail the exact position of the lacrimal crest.

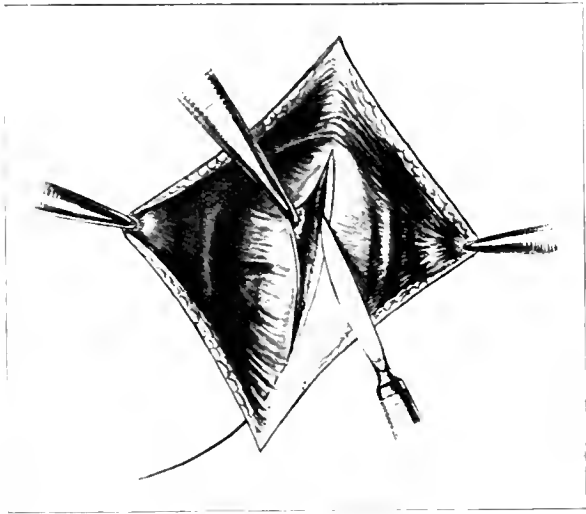


Fig. 6

A small scalpel should be used and the incision started 1 or  $1\frac{1}{2}$  mm. above the triangular ligament and the cut made *directly down to the bone* and following along the crest as close to the lip as possible downward and outward nearly 2 cm. in length. On separating this wound with one of the special retractors, like Meller's, or by the use of heavy silk sutures passed thru the skin, as shown in cut No. 7, it will be found, if the incision has been made properly, that the bone is exposed all along the lacrimal crest. The next step is to have the assistant hold up the upper angle of the wound with a large strabismus hook, similar to the Smith cataract hook (cut No. 8). This helps to control hemorrhage and enlarges the field of operation. With a knife an



incision should now be made thru the periosteum from above downward, if the first incision did not cut clean to the bone. This

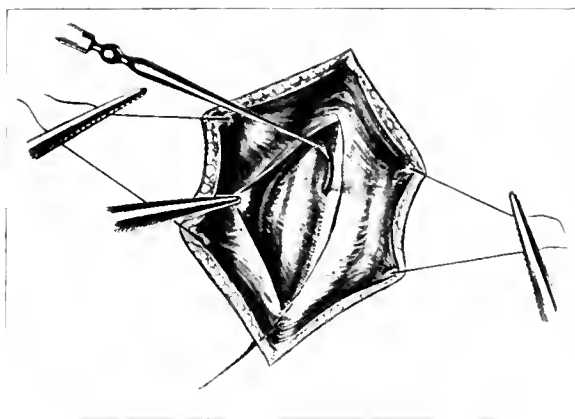


Fig. 7

periosteum incision follows as close to the edge of the crest as possible. Usually about  $\frac{1}{2}$  mm. is enough to prevent endangering

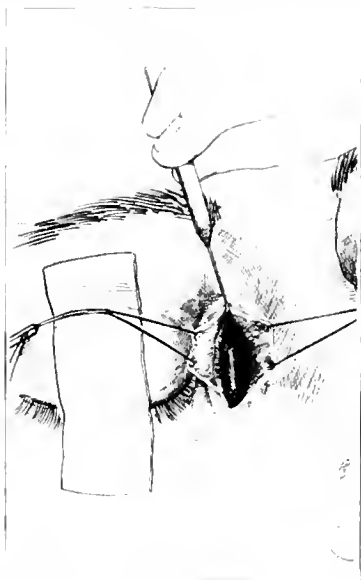


Fig. 8

a slipping over into the sac. On separating this periosteum to the crest it will be found difficult to go farther as here it is firmly attached to the bone and to the deep fascia which lies over the

sac. In fact the deep fascia and periosteum are intimately interwoven at this point. It being impossible to separate the periosteum any farther a knife point can be used to cut thru close to the bone and at once the sac comes into view (cut No. 6). The nick thus made should be enlarged upward and downward until the sac is thoroughly exposed (cut No. 8). The above method of finding the sac, which only takes a minute or two, has never failed in the hands of the author and the postgraduate students, after they have once had this operation properly demonstrated to them, seldom fail to find the sac easily and quickly. Following the exposure of the sac a periosteum elevator may be used to pry the sac from the anterior portion of the lacrimal fossa, this being part of the lacrimal crest of the maxilla and made up of heavy bone. Posterior to this, however, lies the portion of the lacrimal fossa which is made up from the nasal bone and here great care must be exercised not to perforate or enlarge the perforations which may already exist in this structure. At this stage the author prefers to use a strabismus hook, gently separating the sac from its posterior bed (cut No. 7). Two hooks are very useful for this procedure and after they have been passed behind the sac they can be moved up and down until the sac is well freed except at the dome and at the entrance to the canal. The above part of the operation can be done quickly, easily and with no hesitation. The next step is a little more difficult, but is simplified by taking a broad hold on the temporal cut edge of the periosteum and fascia with a pair of fixation forceps. The deep fascia and periosteum are very much more prominent at the upper part where they are incorporated with the triangular ligament. After the sac has been separated in this way from the deep fascia it is possible to pass the strabismus hooks completely around the sac (cut No. 9). The hook can then be slid downward until it comes up against the bony ridge of the lacrimal canal. The sac is then grasped with mosquito forceps as low down as possible and cut off deep in the lower part of the fossa. The sac is now lifted out of its bed, the canaliculi cut and the dome of the sac separated from the upper part of the fossa. This is another point where a good deal of care is necessary because the sac at this point is very firmly adherent and usually has to be snipped away with the points of a pair of curved scissors.

The whole operation in the majority of cases need not take more than ten minutes. It is the author's custom to curet the lacrimal canal before closing the incision in the skin, but this is

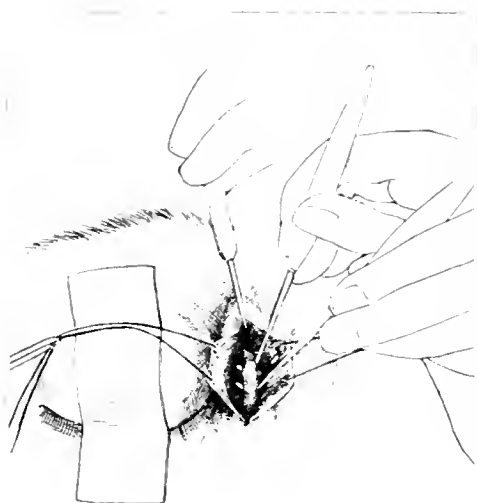


Fig. 9

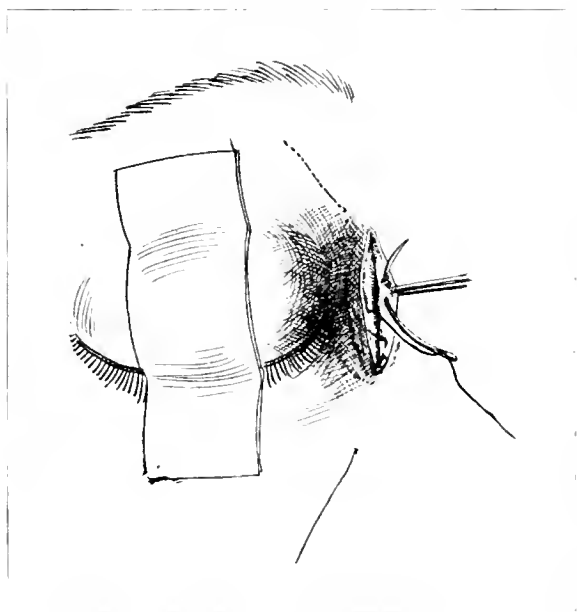


Fig. 10

not always necessary and in patients who are operated on under local anesthesia is apt to be rather painful, though this can be largely overcome by swabbing first with adrenalin and cocain. The skin incision can be closed by interrupted suture, or as is shown in the accompanying cut (cut No. 10), by continuous subcutaneous suture. The author is convinced that a more rapid healing is obtained if, at this stage, a suture is passed around the canaliculi both in the upper and lower lid, just to the nasal side of the puncta. This suture can be tied with a fairly tight knot ending in a bow knot so that it can be easily removed at the end of two or three days. This prevents tears from entering the space left after the removal of the sac during the process of healing. Sterile vaseline is applied over the region of the closed incision and pads of gauze of increasing size placed over the corner of the eye in such a way as to insure good pressure over the region of the lacrimal fossa. This dressing should not be removed inside of forty-eight hours and it is better left for even a longer period when it can be removed and no further dressing is necessary.

It is very exceptional that healing by first intention is not secured and the patient allowed to go about his business at the end of the third or fourth day.

The resulting scar is so insignificant that it is soon lost in the natural skin creases at this point.

#### DISCUSSION

DR. HAROLD GIFFORD, Omaha: I am a poor man to discuss extirpation of the sac. I never extirpated one. I do not know how I happen to be on here; but if I had known the exact method Dr. Greenwood has given perhaps I should never have tried to destroy a sac with trichloroacetic acid. I was fortified in not excising the sac by the fact that nearly everyone who had done it admitted in private that he wanted to get a substitute for the operation. I learned to destroy the sac with the Paquelin cautery in 1886. I got a perfect result and I did that for several years; but I always had a suspicion I should injure the bone and get some necrosis; so when I got acquainted with the trichloroacetic acid I used it. The only case in which I have regretted using the trichloroacetic acid was one in which there was a bad ulcer of the cornea and in the desire to get a thorough destruction, I overdid it and got so much swelling that it prevented proper treatment of the ulcer. In that case I should have done the extirpation instead of the destruction of the sac. It does not take more than three or four or five minutes after you get accustomed to it. I am very much impressed with the simplicity and good sense of this method of Dr. Greenwood's and next time I have an ulcer of the cornea and want to get rid of the sac, I shall try the method, instead of the destruction of the sac.

I am much impressed with Dr. Burch's method of doing this. Some years ago, I adopted the principle of endeavoring to cover the edges of the opening into the nose by turning in the inner wall of the lacrimal sac. I first made a good sized opening directly through the outer wall of the sac, then after turning the sac out of the fossa, and making the hole into the nose, I made a crucial incision in the inner wall and pushed gauze through from the skin opening into the nose, leaving it there to be pulled out gradually through the nose. This plan has succeeded very well in several cases in which I have tried it, but I can easily believe that the plan of using the upper part of the duct, as Dr. Burch has done, is an improvement. There is one sort of case in which the Toti or any other operation involving a little hole into the nose should, I think, be ruled out. This is the case in which we wish to prepare for a cataract operation in the presence of dacryocystitis. I believe it is better to destroy or extirpate the sac rather than to make a large hole so as to allow free communication between the innumerable germs of the nasal cavity and the conjunctival sac.

DR. WALTER R. PARKER, Detroit: I have had no experience in performing the modified West operation, but I understand one of the principle indications for the extirpation of the sac is to rid the patient of the possibility of a continued probing. Some of the advocates of modified West operation admit that in not a few cases the use of the probe is necessary for an indefinite time after the operation has been performed. It seems to me that until such time as an operation is perfected which will rid the patient of the use of the probe, extirpation is to be considered as a possibility in the surgical treatment of these cases.

I have done the operation as described by Dr. Greenwood, with minor changes, for some considerable time. I want to corroborate all he has said in regard to the simplicity of his operation. I have not made the time record he has, but it is simpler than to dissect down layer by layer and there is very slight manipulation. The tying off of the canaliculi I have never done. After the sac has been freed it is important to divide the lower end first. This enables one to complete the dissection of the upper end before the canaliculi are divided. After the removal of the sac the lacrimal duct is curetted. I now use local anesthesia whenever possible. For many years I used a general anesthetic, but with the use of novocain and adrenalin one can do a practically bloodless operation without great inconvenience to the patient.

DR. W. L. BENEDICT, Rochester, Minn.: I believe, wherever it is possible, to do an operation on the lacrimal sac with preservation of its function, we should use every possible means to avoid destroying the sac. It is better not to have the canaliculi slit. Very frequently, though there is an opening from the sac to the nasal chambers, it is still impossible for all the tears to be taken care of because of faulty position or destruction of the punctum. The duct should be probed to locate the obstruction. If the obstruction is in the duct and the sac is intact, that case is favorable for intranasal dacryocystostomy. If the lacrimal sac is destroyed intranasal dacryocystost-

omy should not be done. Obstruction in the duct is often secondary to disease of the ethmoids. Whether such disease can be found by rhinoscopic examination matters not at all. Some of the cases of greatest ethmoid disturbance do not show it by rhinoscopic examination. Any operation that does away with the sac without permitting examination of the ethmoids does not allow the operator to investigate a frequent dacryocystitis. I have frequently found supuration of the ethmoids, when extirpating the lacrimal sac, and in one case found the middle turbinate bone lying loose in a large pocket of pus.

DR. C. W. HAWLEY, Chicago: Dr. Greenwood describes a simple method for getting out the sac. It is one I have never done upon the living subject, but in teaching it in my work in Chicago, I have demonstrated on the cadaver both methods, one similar to Greenwood's and also the Meller operation. I differ from Dr. Greenwood in one respect. It is this: it is not necessary at all to cut the tendon of the lid. I have never found it necessary. I have always been able to dissect it without cutting the tendon. The operation is an improvement on the Meller operation, and I would strongly recommend it. The next sac I take out I shall try it.

In regard to the other paper, I have never been in favor of attacking the sac through the nose. I think in leaving so large an opening, so near the eye, it may trouble us later in cataract operations, etc. Another objection is that you can't probe the tube without slitting the canaliculus. I have not slit one in fifteen years and those that have gotten well I have probed with small probes. I have a set of probes I got from London with a dull point with a slight bulb to it. I can insert these in a canaliculus, first a No. 1, and then a No. 2. I demonstrated that to my class on Tuesday, and the boys said, "Are you not going to cut the canaliculus?" but I did not have to.

DR. MEYER WIENER, St. Louis, Mo.: Regarding the remark of Dr. Parker about the necessity for continuous probing, this is not necessary, if the technic is carried out properly. Nose and throat specialists have performed the so-called Wiener-Sauer operation, which was not our operation, with bad results. But if the operation is performed properly and the after-treatment carried out, and the washing out of the sac a week or ten days or two weeks and probing every second or third day, it almost always is successful. Some cases are not successful, and there is one good reason, which I shall not mention now, as it is in my paper for New Orleans. One important thing is the canterization of the nasal bone with silver daily. I have never seen a complication from infection or otherwise from this intranasal operation, and I agree with Dr. Hawley it is not necessary to slit the canaliculus, which is bad practice. I use the Ziegler probe, which is large but can be passed by dilating the sphincter without slitting the canaliculus.

DR. J. S. CLARK, Freeport, Ill.: It is easy to see that the last word has not been said with regard to the treatment of chronic dacryocystitis. We know that the ancients, including the Egyptians, endeavored to effect a cure in these cases of tear sac infection.

It was in 1913 that I came to know Dr. J. M. West, who was then working in the clinic of Prof. Silex in Berlin. In October, 1914, I came as a guest before this society and read a paper at Boston upon

the subject of the intranasal operation for the relief of dacryocystitis as then practiced by Dr. West.

In 1914, at the Chicago meeting of this society, I gave you a report of further experiences I had had and in that paper spoke of some new procedures.

I believe that in some cases of dacryocystitis it is wise to use the method of extirpation. In others the endonasal. I believe in following the indications as to the method of treatment.

Dr. Greenwood's method appeals greatly to me. In association with the late Dr. Charles H. Beard, in 1906, I came upon his method which quite closely approximated that of Dr. Greenwood. One point concerning the line of incision. It is very comforting when you cut down upon this ridge and retract the tissues to be able to see the vein and artery are well back out of your way and not injured. Also when you have nicked the deep fascia to find the sac presenting itself looking like a large vein. It is the accidental cutting thru of either the fascial vein or artery that gives the great discomfort to the operator.

From the patient's point of view an operation that will preserve the lacrimal apparatus and have it in such a state after the operation as to permit its physiologic function to be continued; such an operation, I say, will be the one most greatly preferred. Not all skulls readily permit one to do the endonasal operation. The formation of the lacrimal fossa may be pretty much all hard bone or thin, depending upon whether it is the paper plate which predominates or the nasal process of the superior maxillary bone, the latter being very dense and hard bone.

Dr. Wiener in discussion speaks of a new operation. I brought this before this society in my paper, read before you in 1915, in which I spoke of a case where I broke through the paper plate of the lacrimal bone with a probe and then used the nasal forceps which I devised for that purpose.

I have done all the procedures for the relief of dacryocystitis that have been advocated in the last ten years, and while I believe that extirpation of the sac will be satisfactory to the surgeon in most instances, yet if we consider the patient's point of view we will more and more make use of the endonasal operation.

Dr. J. M. BANISTER, Omaha: I have long since abandoned the routine slitting of either canaliculus, substituting the dilatation of the opening at the punctum and the passage of probes through the canaliculus into the lacrimal sac. When we remember the anatomy of the parts and recall the fact that the superior canaliculus occupies a position very much in line with the direction of the nasal duct, it is evident that it will be much easier to pass a probe by way of this channel down through the duct referred to. When we operate upon these cases of dacryocystitis, one great desideratum is the prevention of infection of the cornea, through possibly some slight traumatism of the corneal epithelium, by means of the highly infectious pus entering the conjunctival sac through the canaliculi. Such infection may induce an *ulcus serpens* of the cornea, with all the evils which such infection entails. In these cases the offending organism is almost invariably

the pneumococcus. Our object must be to get rid of the sac, and thus remove the danger of disastrous consequences to the eye through corneal ulceration, as well as to relieve the distress caused by the chronic suppuration. I do not think that in these cases the drainage into the nasal cavity by the intranasal operation is the ideal method. Such operation cannot be counted upon to prevent the pneumococcus infection from getting through the canaliculi into the conjunctival sac. Also in cases of cataract operation such drainage of pus into the conjunctival sac might prove disastrous. I am much pleased with Dr. Greenwood's operation. The Meller operation I have used, and invariably found it extremely difficult or impossible to dissect through the tissues layer by layer. The views of Dr. Gifford in his method of obliterating the sac by the use of trichloroacetic acid I can heartily endorse, as, in following his teaching in this regard, I have secured excellent results.

DR. J. D. PIER, Joplin Mo.: In the discussion of Dr. Greenwood's paper it is hard to confine ourselves to it without digressing as we have not used his method. We can only see that it looks feasible as this subject is interesting to us all. I hope the chairman will bear with me. The doctor did not quite make plain whether he operated on all cases of infected sac or not. I believe in conservatism, and many of these cases can be treated without extirpation. I slit the canaliculi, pass the Bowman probes up to 4 or 5, and then put in a solid 18 karat gold style bent so that it will rest in the slit duct where it can be worn for years. If there is much pus in the sac it can be removed occasionally and a few drops of saturated solution of argyrol injected without using any force. This soon stops the pus formation, and women who have fear of a scar on the face will submit to this conservative treatment rather than to a more radical operation. If this fails I slit the sac and swab it out with trichloroacetic acid as per Dr. Gifford's method. I have used this in the very old and quite young equally successfully.

DR. F. E. BURCH, (closing discussion): With regard to making the nasal opening I wish to say I am having a punch made now similar to the Morax punch which will prevent this.

My first effort at making a nasal opening through the nose was after the method suggested by Schoch with direct puncture into the nose and introduction of a small rubber catheter which was left in situ. In many instances this procedure has been sufficient to reestablish drainage of the lacrimal secretion into the nose.

DR. ALLEN GREENWOOD, (closing discussion): I am going to answer Dr. Pifer first, and, with all the emphasis at my command, say that never should argyrol be injected into a lacrimal sac under any circumstances. (Applause). I distinctly said that this operation was brought to your attention to simplify the extirpation of the sac and not to go into the other methods for the cure of sac affections. Most of these people are past middle life and some may have cataract operations later. There is no clearly visible scar in any patient I have operated on. I know Dr. Parker has used this method. Dr. Lancaster has, and I am sure many of you have, but I wanted the younger men to see how simple this operation is. After finishing the removal



of the sac, it is my custom to curet the lacrimal duct down a little way into the nose and remove as much diseased tissue as possible. In tying the canaliculi, I simply tie a bow knot so that in removing my dressing I can remove the suture easily and this tying helps in the primary healing. The satisfaction to my patients has been complete. After they leave the hospital on the third or fourth day, no further treatment is necessary. They are through. I will say to Dr. Benedict that I believe in trying conservative methods first, but you \* must occasionally extirpate the sac and by following the very simple instructions I have given you today you cannot help finding it quickly and easily.

# THE APPLICATION OF COMPENSATION FOR EYE INJURIES BY THE WISCONSIN STATE INDUSTRIAL COMMISSION

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A special legislative committee recommended a Workmen's Compensation Act in Wisconsin in 1909, which was passed in 1911. The succeeding legislatures have not seen fit, nor has the Commission recommended a material increase in compensation for injury to one eye, due to the observation that workmen following injury to one eye have returned to their same work, or to similar work, without material reduction in earning power. Compensation is fixed at 65 per cent of the average weekly wage. The maximum average allowed at present is \$22.50.

The schedule specified in the law was, up to 1917, for total blindness of one eye, 140 weeks; for total blindness of the second eye, 280 weeks. The interpretation of total blindness and the administration of the law is reposed in the Industrial Commission of Wisconsin. During a period of nearly ten years in which eye cases have been settled and compensation awarded, the great bulk were what might be said to be usual cases.

The purpose of the law is to afford speedy and just compensation to the injured without placing a premium upon injuries. Through the recommendation of Mr. F. M. Wilcox of the Industrial Commission, there were included among the last amendments which went into effect in August, 1919, several very practical and just sections dealing with Special Indemnity for Second Injuries,<sup>1</sup> as follows:

"Section 2304-9 (6). In the following cases special indemnity shall be paid an employe only from the funds provided for in subdivisions (d), (e) and (f) of this subsection in addition to the allowance provided in subsection (5) of this section, after cessation of the payments therein prescribed:

"(a) If an employe has previously incurred permanent partial disability through the loss or total impairment of a

hand, arm, foot, leg or eye, and by a subsequent accident incurs permanent total disability through the loss or total impairment of the other hand, or the other arm, or the other foot, or the other leg, or the other eye, or through the loss or total impairment of another member or organ, an amount sufficient to complete indemnity liability as for permanent total disability.

“(b) If by reason of the loss or permanent impairment of any member or organ specified in the foregoing subdivision by a subsequent accident, where loss or total impairment of another member or organ existed because of a prior accident, the employe shall sustain necessary wage loss in excess of that for which indemnity is provided in subsection (5) of this section, an amount sufficient to complete the payment of such indemnity as would have accrued if the injury to both members or organs had been caused by a single accident.

“(c) Where permanent impairment of both eyes is caused by a single accident, such additional amount as shall be necessary to complete indemnity for such disability period as the nature of the injury bears to one causing permanent total disability.

“(d) In each case of the loss or of the total impairment of a hand, arm, foot, leg or eye, the employer shall be required to pay the sum of one hundred and fifty dollars into the state treasury.

“(e) Moneys paid into the state treasury pursuant to the foregoing subdivision, with all accrued interest, is hereby appropriated to the industrial commission for the discharge of all liability for special additional indemnity accruing under this subsection.

“(f) For the proper administration of the funds available under subdivisions (d) and (e) the Commission shall, by order, set aside in the state treasury suitable reserves to carry to maturity the liability for special additional indemnity in each case, and for any contingent death benefit.

“This subsection, with its six subdivisions, was added by Chapter 680, Laws of 1919, effective August 1, 1919. In the main, it has a twofold purpose in modifying the 1917 act: first, to eliminate the incentive for discrimination against the employe who has previously lost an eye, hand, arm, foot or leg, when he comes to seek reemployment, because of the

employer's fear, real or otherwise, that the loss of another member might subject him to very large indemnities on the ground that such loss would cause total or near total disability; second, to secure to the employe sustaining the loss or total impairment of a second member, such amount of indemnity as the seriousness of the injury entitles him.

"The best illustration of the underlying reasons for the legislation is found in the 1917 schedule providing double the indemnity for the loss of the second eye (280 weeks) as that provided for the loss of the first eye (140 weeks). While these provisions were such as to cause employers to hesitate about the employment of one-eyed men and to refuse them employment at times, still the maximum indemnity for the loss of the second eye, \$2,730, was grossly unfair to the man who was made totally blind by such loss.

"Direct liability of the employer in case of the loss of the second member is made the same as for the loss of the first member, and the injured employe's rights are conserved by orders drawn on the fund for the balance of his indemnity. Primary liability of the employer for payment of the \$150.00 to the fund is insurable."

The Commission may add to the specified indemnity as stated under the Disfigurement Amendment.

"(f) If an employe is so permanently disfigured about the face, head, neck, hand or arm as to occasion loss of wage, the Commission may allow such sum for compensation on account thereof as it may deem just, not exceeding seven hundred and fifty dollars."

The paragraph regarding Reductions for Age will probably require adjustment and more latitude be allowed the Commission in considering compensation at various ages.

"(g) In case of permanent injury to an employe who is over fifty-five years of age, the compensation herein shall be reduced by five per cent; in case he is over sixty years of age, by ten per cent; in case he is over sixty-five years of age, by fifteen per cent."

Should anyone be dissatisfied with the decisions of the Commission, the case may be reviewed by the Circuit Judge in the district where the injured resides. The Judge could only review the testimony as gathered by the Commission and the testimony of the various ophthalmologists, assent to the

Commission's award, or return the case to the Commission with instructions to procure more evidence, or opinions bearing on the case.

The Commission vindicates its rulings upon the testimony presented by the examining ophthalmologists. The curiosity of the Commission was excited after making awards of one-half of that for total blindness upon an oculist's report of vision of 20, 40, to find the former injured man was accepted for military service. They could not patriotically stand by and see the army accept men who were half blind in one eye. Such is the testimony of experience as to the practical application of the elaborated tables of Magnus and other writers.

What was desired by the Wisconsin Industrial Commission was a simple table expressing vision in one eye in the usual case. The problem was submitted to the Milwaukee Oto-Ophthalmic Society, who reported to the Industrial Commission that all unusual conditions involving cosmetic appearance, unusual diplopia, or interference with stereoscopic vision, pathologic disturbances in the retina, or other structures within the eye extraordinarily limiting the fields of vision, or affecting the central nervous system or bodily health of the injured person, should be determined in each case by the ophthalmologists and could not be encompassed by a table recording central vision. To this the Commission replied that they did not assume to limit the eye specialists in this technical study of the case, but they hoped that a simple table could be agreed upon which laymen could understand, and which would interpret the vision present in the injured eye in the usual cases coming before the Commission for compensation.

The first essential of such a table is practicability. As stated at the outset of this paper, men do return to about the same sort of workmen's duties with one eye as they did with two eyes. Reference to the numerous instances of unnoticed amblyopias in one eye adds but embarrassment to the speculative study of limitation of function and loss of earning power. Experience shows that for crude work and for much of the usual work of a mechanic there seems to be a compensatory function of one eye in regard to stereoscopic vision. Some general surgeons with one eye perform their technical manipulations with exactness, as well as special surgeons

whose vision is limited to that permitted through the bull's eye of a head mirror. May we not agree with the Commission that a table deduced from the recording of central vision in the usual case carries with it the greater loss of stereoscopic vision as the central vision is diminished, and also, in the usual case, the reduction of the visual field accompanies loss of central vision?

The Commission was concerned in determining the point of total blindness. The question being an industrial one, the degree of blindness need not be an estimation of the selective stage for cataract operation nor that preventing a person from passing through an open door into a lighted room, but rather that blindness at which his vision would not be of industrial value. This is a point upon which it is hoped our opinions are not too far apart.

The Wisconsin Industrial Commission endeavored to dispel the confusion caused by the misrepresentation of the Snellen table. They addressed several questions to the Milwaukee Ophthalmology Society, which I reported to the Chicago Ophthalmological Society and which appeared in the November, 1919, number of the American Journal of Ophthalmology.

The first and inclusive question is, is a table recording vision by reading the Snellen test type letters practical? The Commission have been using such a table for several months. Divergence of opinion was the rule at our meetings and committee meetings, but finally we submitted a tentative table. This table was similar to Chapman's (presented to this Academy at the Pittsburgh meeting) and other tables heretofore presented, in that an arithmetic progression was allowed for every ten feet as expressed by the reading of the Snellen denominator. Beginning with 3 per cent loss of vision for the first ten feet, the 100 percentage loss ran out to 20/450. The Milwaukee table 100 per cent loss came to 20/350. This method did not satisfy the Commission, so in May, 1919, they requested an open meeting of all the oculists of the state. Nearly half of the number present were from Milwaukee.

At this meeting we admitted, for lack of good evidence to the contrary, that vision at 20/200 was not of much industrial value and that if the Commission was willing to allow the full award we would not protest. Dr. Chapman held out for 20/220. Dr. Gradle came up from Chicago and offered a variable

percentage table with 20/200 as industrial blindness. Dr. William N. Sharp<sup>2</sup> and Dr. Frank Allport<sup>3</sup> have submitted tables with 5% progression for each ten foot reading and allow 20/200 as 90% visual loss.

An arithmetic table which shows about 6% progression is as follows:

Vision	Percent Visual Loss
20/20	0
20/40	11.2
20/50	16.7
20/60	22.5
20/70	27.8
20/80	33.4
20/100	44.5
20/120	55.6
20/200	100.

Prot. Max Mason of the University of Wisconsin prepared a geometric table for Dr. Nelson M. Black in which the decrease of percentage varies as linear dimensions of letter  $\therefore$  as  $X/P = 100/9(10-X)$ .

Vision	Percentage Loss
20/20	.0
20/30	5.6
20/40	11.1
20/50	16.5
20/60	22.
20/70	28.8
20/80	33
20/100	46.
20/120	56.
20/140	67.
20/160	78.
20/180	89.
20/200	100.

To my mind the geometric table expresses the actual loss of vision more exactly than any other mathematic table. The Industrial Commission are satisfied to allow the total award for 20/200 vision and accept the prevalent opinion among ophthalmologists in Wisconsin, that 20/200 is industrial blindness. This point is not disputed by the employers, the employes or the compensation insurance companies. The Commission did not feel that the geometric table denoted a sufficient award for 20/50 and less, which they believe is the greatest loss to a workman, inasmuch as his work approximates near vision, more than distance, and vision near or about 20/50. In consultation with Mr. Wilcox

of the Wisconsin Industrial Commission I submitted the following table:

Reading	Percentage Loss
20/20	0
20/25	5
20/30	10
20/40	20
20/50	25
20/60	33 <sup>1</sup> / <sub>3</sub>
20/70	40
20/80	50
20/100	75
20/120	85
20/200	100

This table has been used for several months and has met with favor by the Commission and the interested parties appearing before the Commission. Inasmuch as all such tables are arbitrary we feel that the selection of 20/200 as the point of industrial blindness will be more generally accepted and is of greater ease of determination than any reading beyond this point; the readings down to 20/60 are in round numbers approximating the mathematic calculation of the geometric table, and the readings of 20, 60 and less allow a fair interpretation of loss of vision for the employe's usual work near at hand.

After accepting a workable table the Commission has embodied the general opinion in Wisconsin concerning frequent conditions present after eye injuries. If the vision can be improved by glasses the compensation is one-half of the differences, without and with glasses, plus the compensation with glasses. Should it be deemed necessary for the injured to wear colored lenses, 5% is added to the other per cent allowance.

For traumatic cataract the compensation is 50% with the additional compensation for vision obtained with glasses. The opinion of more than one ophthalmologist is sought in each case of traumatic cataract as the award approaches, or from the table exceeds 100%. The usual opinion given when the patient refuses operation for traumatic cataract is that it is in part a remedial condition and that 50% is equitable compensation.

The Commission does not rule on diplopias without expert opinion in each case. The Milwaukee Oto-Ophthalmic Society recommended 20% for uncorrected cases, and 10% for corrected cases.

Illustrative cases:

H. D. received injury to cornea of the right eye, with resulting nebula and vision reported 20/30. He was furnished



free medical services, but received nothing for time lost from work, as he was unable to work less than one week. Compensation awarded was 10 per cent of the total award. His wages were the maximum of \$22.50 per week. The award was 65 per cent of \$22.50, or \$14.63 for fourteen weeks, a total of \$204.82.

R. V. received injury to the right eye from hot steam and fire in an incinerator room. Resultant injuries were symblepharon of the right eye, with nebula at lower edge of cornea beyond pupillary area. Patient insisted vision in right eye was much worse than in the left, which was not injured. Vision both eyes without glasses was equal 20/100; with +0.75 cylinders, axis  $165^{\circ}$  in the right eye and  $180^{\circ}$  in the left; vision was admitted to be 20/65 in both eyes. Under cycloplegic with same correction he read 20/40 letters, both eyes. Media were clear in both eyes, with some pallor both discs. The symblepharon of the right eye did not limit movements of the globe. A small pterygium was present in the right eye. Had the injury reduced the vision from 20/20 to 20/100 corrected by glasses, the Commission would have awarded him one-half of the difference of the award with and without glasses. Vision 20/100 compensation is 75 per cent, his vision with glasses was 20/40, compensation is 20 per cent, one half of the difference between 75 and 20 is one-half of 55 or  $27\frac{1}{2}$ . Compensation would have been  $27\frac{1}{2}$  per cent of total compensation, plus that for other defects. In this case I could not report other result of the injury than the symblepharon and nebula of cornea outside pupillary area, and a pterygium which was probably not caused by this injury. In view of the presence of symblepharon, the Commission were disposed to allow compensation of 5 per cent of the total award.

O. M., age 65, received injury to cornea of right eye while cutting frozen snow and ice from the city streets. Leucoma of cornea resulted, with vision reduced to light perception. His daily wage was \$2.00, weekly wage of \$18.42. Reduction for age was 15 per cent. His full compensation per week would have been 65 per cent of \$18.00 or \$11.97 per week for 140 weeks, but this was reduced 15 per cent, so that he is receiving \$10.18. The city did not take him back to work on the streets and he was too old to learn to work at a bench. The reduction for age was unjust in this case.

T. C. was injured in a stone quarry April 30th. Examination May 18th showed dense scar over lower half of pupil of left

eye; slight slough of cornea, punctate spots on posterior surface of cornea. Vision right eye 20/20; left eye 20/100. June 16th patient was discharged from treatment. Vision right eye 20/20, vision left eye without correction 20/80, with correction 20/50. Compensation recommended was  $\frac{1}{2}$  the difference for that of vision of 20/80 and 20/50, plus the compensation for 20/50 vision, making in all  $37\frac{1}{2}$  per cent.

M. J. received traumatic cataract from nail injury January 24th. Seen May 25th with scar on cornea at point of puncture; lens completely cataractus. September 22nd final examination and report; vision with correction, plus 12.00 plus 1.50 axis 90°, 20/40. Compensation will be 50% for loss of the lens and 20% for 20/40 vision, or 70% in all.

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#### DISCUSSION

DR. H. A. SMITH, Delta, Colo.: The matter of state compensation has been originated and the law is put in operation by layman. The administrators of the law are officials without the least conception of loss of vision, as expressed by the terms which we as oculists use. To them 20/20 means a fraction, so counting from this they arrive at a mathematic result, which is not correct. When we use 20/20, 20/30 and 20/40, they are far from being the visual result as expressed in percentage. By referring to the tables that Dr. Higgins presents here, it will be noted that there was a wide variation in the percentage tables. When oculists do not agree on a percentage, it is extremely difficult for layman to do so. It is one of the axioms of law that a rule had better be fixed than be correct. The practice of most industrial commissions is to consider 20/200 industrial loss of vision. If 20/200 represents industrial loss of vision, or one hundred per cent, it is a simple matter, which every layman can understand, to allow each foot of distance to represent one-half of one per cent loss. The essayist presents one table which agrees with it, except in a very minor point. This is, as you will see, already a nation wide affair. And this schedule, if followed, should present a method to determine a loss so simple that in any part of the nation, they can use it without explanation. I suggest the following; for each loss of one foot distance, allow one-half per cent loss. Then at 20/200, 100 per cent loss will be established.

DR. PARK LEWIS, Buffalo, N. Y.: The discussion as to the determination of an exact standard for measuring vision, has increased in importance because of the industrial compensation involved. We all know that present methods are inexact. It is our duty, however, rather than that of lay adjusters to establish this standard

All of the methods proposed are based upon an arbitrary denominator.

We must arrive at a more exact method of determining and recording the visual loss and then together with the commissioners we may reach an agreement as to what ratio this bears to previous or normal sight and the proportional value of the loss suffered.

DR. HARRY GRADLE, Chicago: None of these are table of compensation. They are the endeavor to present efficiency of monocular vision. The compensation cannot be based on this alone. All the other facts indicated by Dr. Lewis should be taken into consideration. These have proven absolutely impracticable from the practical standpoint. But we must make a compensation table upon which the ophthalmologic profession of the United States will agree. We must stop the bickering between this and that man and get to something. This must cover every possible injury to the eye. They should be able to take the man and say he has so much vision in this and that eye and is entitled to so much compensation. That must be agreed upon by the oculists as a whole. It must be submitted by a society. The Chicago Ophthalmological Society has such a table which is called the table of monocular visual efficiency. It is not a compensation table. It starts at zero and goes to 200. It agrees that 20/20 is standard and 20/200 is industrial blindness. 20/20 is not what Snellen suggested. He merely meant this to show the two phases that enter into vision. We take it as a fraction and read it so, and the Boards cannot understand why we write it as a fraction and do not use it so.

We have to take into the question the difficulty where there is a disturbance of the central vision of one eye. We have got to take into the account the class of cases resulting from muscular injury, etc. We will have to take into consideration the visual field of one eye alone, and the cases that have disturbed visual fields of two eyes without disturbance in the central vision, and when we have done this and unite on a standard table, then only will we be able to present this to the legislature and show them something that everyone will agree on.

DR. H. B. YOUNG, Burlington, Ia.: We have got to get rid of the Snellen test as a standard for loss of practical vision. When I began my investigations with regard to the vision of train men in 1903, I found that one might have 20/25 and another 20/15, and the one be as efficient as the other in service. I also found that 20/20 usually meant better than 200/200 or 500/500, a sort of progressive increase. Further than this we know that 20/50 is not incompatible with ordinary newspaper type at the reading distance. With the fractions so misleading the wonder is that it has ever worked at all in arriving at just compensation.

DR. N. M. BLACK: The subject of visual economics is one that can be argued pro and con to the end of time.

I doubt very much whether our premises in the question are correct, when we assume to estimate the compensation to be given a man for an injured eye on his central visual acuity at 6 meters distance. He does not do his work at that distance. Should not

his visual efficiency be determined by his ability to see in the near, or, at the distance at which his work is from his eyes in the occupation at which he is employed? Such vision to be estimated, not by reading print, but by characters comparable in size to the objects with which he works.

We know very well that as a result of an injury, an eye may have a partial traumatic cataract, or the vitreous body be filled with opacities, and the man have fair distance vision and be absolutely unable to distinguish very coarse print. In such cases, if compensation is based on his distance vision he is not being paid the amount he should receive for the loss he has sustained.

In my opinion, we should estimate the loss of vision in determining compensation for ocular injuries by the ability to see in the near, not to read print necessarily, but by the ability to recognize familiar objects. For this purpose the "Universal Test Characters (particularly applicable as visual tests for children)" by Dr. Arthur E. Ewing, (St. Louis) seem extremely well adapted. These are outline pictures of familiar objects.

The lines of these characters subtend a 1 minute angle, and the whole character a 5 minute angle. On the series of charts designed by Dr. Ewing, the size of the characters ascend in geometric progression from 0.31m to 50m, i. e., the distance from the eye at which the characters subtend the 5 minute angle. Thus one has a range of tests for very acute vision in the near, up to what is considered by many as industrial blindness, (5, 56).

I do not wish to be understood as advocating the elimination of distance vision in estimating compensation; it cannot be done. We could not otherwise determine and correct errors in refraction which may exist. But the ability to distinguish detail at the working distance should be the basis on which compensation should be estimated.

DR. HIGGINS, (closing discussion): In the meantime, three thousand decisions have been rendered in Wisconsin and when you get a few thousand more you will have to do a lot of pulling to set up a new system. These tables are submitted to show you our troubles. We could not get them all recommended, especially this geometric table, although it is the nearest approach we have to a mathematic calculation. This table of Dr. Black's has the same advantage as suggested by the first speaker, that if you take one half of the denominator you have the compensation, which is the simplest thing to imagine. My modifications give the largest awards for distant vision over 20/80. The only way to determine the percentage loss of vision is to test out a hundred or thousand men possessing vision at the various readings. I am happy to notice that no one has said anything about a person having 1/10 vision. I do not know how Dr. Gradle will do refraction on one eye at a time if he uses charts similar to Snellen's. The purpose of bringing this matter up was to ask for support in a national way of the work we are doing in Wisconsin.

I would like for everybody to take home the idea that the Industrial Commissions should depend upon the opinion of the ophthalmologists in making their decision.

## ON BACKING OUT OF CATARACT OPERATIONS

H. GIFFORD, M.D.

OMAHA, NEB.

This paper is offered as an attempt to indicate the best way out of a bad hole. The hole referred to is the position in which an operator finds himself when, on completing the incision for a cataract expression, the vitreous begins to escape before the lens is expelled. In this position he knows that to attempt to expel the lens by pressure means failure with almost certain loss of the eye. On the other hand, if he extract the lens with hook or loop a good deal of vitreous is almost certain to be lost, and while in many such cases the result is fair the average result is, to say the least, poor. The writer has been gradually reaching the conclusion that unless, to prepare for this contingency, he has previously dissected up a large conjunctival flap and inserted stitches with which this flap can be quickly brought down to reduce the escape of vitreous to a minimum, the only justifiable procedure is to back out, that is, to interrupt the operation, desist from any attempt to remove the lens, allow the incision to heal, and deal with the cataract later on by some safer method. The writer confesses that at the bottom of his conclusion is a holy horror of extensive loss of vitreous. This is not founded on any especially bad record in this respect. In the course of 35 years practice I have never lost but two eyes directly from loss of vitreous, and I have fished out many a lens with fair or even excellent results. But in contrasting the results of cases in which considerable vitreous has been lost with those of other cataract operations, I feel positive that if I were the patient, in such a hole, I should insist, if the choice were offered me, on trying the interrupted operation; and where the patient has only one eye, I consider it to be the operator's imperative duty, when confronted with this dilemma, to stop the operation. You may ask: If it is right to do this where the patient only has one eye, why is it not right to adopt the same plan when he has two eyes? To this I can only answer: Why not?

As to the means which should be adopted to get rid of the lens after the first operation has been interrupted, three courses are open. One is to neglect the cataract until the second eye has been operated on; leaving it to the patient whether, after this,

another attempt should be made with the first eye. The second is to get rid of the lens by repeated discissions. The third is to prepare for loss of vitreous by dissecting up a large flap, as indicated above, and to complete the removal of the lens by extraction with a loop or hook after the ordinary incision. The writer has tried all three of these plans with greater or less success.

Case 1. E. L., aged 48, lost all sight in the left eye 15 or 20 years before, through some form of vascular degeneration. The right eye on November 22, 1912, had a cataract two-thirds ripe and progressing very slowly;  $V = 5/200$ , projection good. On November 23, 1912, preliminary capsulotomy made; and as this produced very little result, another capsulotomy was made on December 4, 1912. On December 28, 1912, an ordinary cataract incision was made in the limbus and a small iridectomy was done. On completing the iridectomy, the anterior chamber, instead of remaining empty, filled with fluid vitreous, which escaped in a slow, steady stream from the incision. Confronted with the alternative of removing the lens with a hook or loop, with the probability that this would cause so much loss of vitreous as to seriously endanger the patient's only eye, or of backing out, I decided that if I were in the position of the patient, I should want the surgeon to back out and to do it quickly. So I interrupted the operation, and without disturbing the lens, allowed the incision to close. After a lapse of three months I started again in the attempt to get rid of the lens by repeated discissions. I did the first of these on March 26, 1913, the second on May 16, 1913, and on the day following, the nucleus was found in the anterior chamber showing a nearly clear pupil above. On June 24, 1913, vision with correcting glass was 20/50. The nucleus was allowed to remain in the anterior chamber, gradually getting smaller; and finally after a year and a half, it disappeared entirely.

During this time his vision varied from 20/50 to 20/70, and at times he would have quite sharp attacks of pain with some congestion. These finally ceased, however, and his vision remained at about the same level until January, 1917, when a detachment of the retina developed and the sight was gradually lost.

Not an especially brilliant result, but in view of the tendency to degeneration which both eyes showed, I am quite certain that the man obtained five years of useful sight which he would not have had, if I had completed the removal of the lens at the first operation.

Case 2. G. T., aged 34; had lost right eye as the result of a

cataract operation done when he was a child. The left eye had been under my observation since 1907. At that time it had myopia of 18 D. with numerous vitreous opacities and some atrophy at the center of the retina and V. with correction 20/50. On October 7, 1913, he came to me with a somewhat shrunken hard looking cataract in the left eye. This looked so tough that I decided erroneously that discissions would probably help it very slowly if at all; so I started to do a combined expression; but on completing the iridectomy, fluid vitreous escaped at such a rate that I made no attempt to express the lens but allowed the wound to close and, after repeated discissions, I obtained by September 13, 1915, a clear pupil with the nucleus lying at the bottom of the anterior chamber as in Case 1. It gradually disappeared without causing any disturbance. Vision with correction, 20/200 which he has retained to the present time.

Case 3. (Record mislaid.) J. S., aged about 67. Right eye lost many years before. Left eye complete cataract following blow from a chip of wood some months before. Pupil somewhat irregular from slight iridodialysis. Iris not wobbly, projection fair. Started to do a combined expression. On completing the iridectomy vitreous appeared in the wound, operation interrupted; wound allowed to close without disturbing the lens. Treatment of cataract by repeated discissions begun after about two months. The cataract was absorbed very slowly, but at the end of a year the pupil was clear enough to allow a good view of the fundus, when it was found that the nerve was atrophic. The sight was only fingers at 2 feet. A poor result which would have been good if the nerve had held out.

Besides these one-eyed cases, in which the necessity for backing out of the operation, in order to increase the patient's chance, was rather obvious, I have, for the same reason, backed out of cataract operations with eight two-eyed patients. In two of these the *second* eye was successfully operated on in the ordinary way and nothing further was done to the first eye. In four cases, at the second operation, preparation to limit loss of vitreous by a sliding flap was made; and the lens was removed either by expression or by extraction. The immediate result, in all these cases, was good; the astonishing thing about them being that in two of the cases which had shown prompt and indubitable loss of vitreous at the first operation, there was not the slightest sign of vitreous loss at the second operation; the lens being expressed in the ordinary way without difficulty. In one of these patients the sight of the eye was subsequently lost by detachment of the

retina; but this can hardly be charged against the method adopted, since if the detachment were in any way due to the removal of the lens, it would have certainly been much more apt to occur if the lens had been extracted, with the inevitable greater loss of vitreous, at the first operation. In the seventh case, the lens was cleared up by repeated discissions, with vision 20/30. In the eighth patient the method of frequent discissions is being carried out with such slow progress toward absorption that I am beginning to doubt whether it will not be best to remove the lens with the sliding flap preparation.

Besides these cases in which the reason for interrupting the operation was actual loss of vitreous, I have beaten a retreat in some other cases; either because the incorrigibility or the stupidity of the patient made it evident, in the early steps of the operation, that the danger of loss of vitreous would be decidedly greater than the average and ought to be met with special preparation; or because of some accident or oversight in the ordinary preparatory measures. As an example of the latter contingency, I may cite a case in which with the patient on the table, a nurse handed me a hypo half filled with pure carbolic acid instead of the cocain solution which I wanted. I put three drops of this in quick succession on the center of the cornea before discovering the mistake. Luckily plenty of alcohol was right at hand and after using it very freely, no harm resulted; still I thought best to call this a "preparatory operation," and to postpone the expression of the lens for a few weeks, when it was done with a perfect result.

In another case the patient behaved so badly that after doing the puncture and counterpuncture, I decided that to finish the operation without losing half the vitreous would require a special dispensation; so I desisted without completing the incision and have had no opportunity to do anything more for the patient. If he returns I shall have to do his operation under ether.

The necessity for backing out on account of the behavior of the patient can be largely done away with if the practice is followed of always making the patient come to the table with an empty stomach. If he then reveals himself as an obstructionist or a hopeless squeezer, all that is necessary is to give him a general anesthetic and do the operation in peace and quiet. I don't pretend to follow this rule, but I am convinced that it is a mighty good one; and after any of you have done an expression under a general anesthetic with fixation by the tendon of the superior rectus, I venture to predict that you will begin to wonder whether



it wouldn't be a good thing to do all your expressions in this way. Of course I do not wish to even suggest that this should actually be done in all cases, but there is no doubt in my mind that there is a wider field for general anesthesia in cataract operations, than is generally accepted.

Another way to help avoid the necessity of backing out would be to make more general use of repeated discussions as the primary method in place of expression. It is now evident that in at least two of my cases this would have given a good result with no more delay than is frequently necessary in children. But the difficulty of judging which cases are suitable for this procedure will necessarily limit its use.

Another plan to avoid many of the occasions for backing out, is to do all peripheral expressions with a sliding flap. It is a very good plan to follow. Some years ago,<sup>3</sup> I reported a series of about 130 expressions done in this way without a single loss and with good results in all but two cases, in both of which the visual result was due to anteoperative complications. I never had a better series, and my only reason for discontinuing it as a routine practice was that it took about twice as long as the ordinary operation. But even if one does not adopt the sliding flap as a routine measure, there can be no doubt that when the condition of the eye or the disposition of the patient leads us to expect an unusual amount of trouble, the sliding flap should be used.

As to the psychology, both of the patient and of the operator, in such cases, a word may be worth while. Starting with the self-evident proposition that under no possible contingency should the interests of the operator outweigh those of the patient, we must admit that human nature will not let us crowd our own interests entirely out of sight. We would never think of deliberately sacrificing any advantage for the patient to save our own pride, peace of mind or our purse; but when it comes to deciding, on the spur of the moment, to disappoint the patient and his friends and perhaps have him go off and get a successful result at the hands of someone else, for a purely hypothetical advantage; the decision may not be so easy. Personally, I have never had occasion to regret backing out of one of these cases. In all but one, the patient, when the condition has been explained, has gladly accepted the situation and has felt grateful for the extra solicitude shown for his welfare.

The disposition and experience of the operator will naturally play a large part in forming the decision as to whether any of the emergencies mentioned above demand an interruption of the

operation; but in any given case, the operator can hardly go wrong if he adopts the plan which he would want followed if he were on the table instead of at its head.

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(Includes complete technic of sliding flap operation.)

#### DISCUSSION

DR. ALLEN GREENWOOD, Boston: I think this a very important subject that requires a good deal of careful thought, and I also agree that it takes a good deal of courage to back out, as the Doctor states. I have had to back out of two operations, due to the fact that the lens had been dislocated into the vitreous at the time of the attempted expression and vitreous had begun to escape. I think we should first look, for a moment, at the causes for this condition which necessitates a backing out. I am sure the main cause is the breaking of the zonule at the time of making the incision. Many times, in holding the eye with the fixation forceps, I have felt it was difficult to make one hand stay still while the other was moving, and I have seen operators push or pull a little too hard, and have done so myself. Two things are absolutely essential if we are to prevent this cause for early loss of vitreous: first, the fixation forceps must be absolutely stationary throughout the entire process; and second, the knife shall slip through without undue pushing or pulling. In two or three recent cases where I have had vitreous escape at the time I tried to express the lens, I have known that I had been making too much traction on the eyeball. Dr. Gifford speaks of several cases of operation on one eye where the other had been lost, and in such cases I am sure you are less likely to lose vitreous if you do a preliminary iridectomy. I will not operate on an only eye without the preliminary operation. Preliminary iridectomy, carefully done, will allow you to extract the lens with less difficulty and traumatism. I do not do it in every cataract case because many do not want two operations, and in the very old and nervous, one operation is often preferable. If you put it to the patient with only one eye he will usually say "yes."

Dr. Gifford contrasts the terms expression and extraction. There will be less of this in the future, because the day is coming when lenses will be extracted and not expressed. In my last eight cataract operations every lens has come out in the capsule and without any pressure on the globe. I *do not* break the zonule with Smith's hook, but hold the capsule firmly and with the Verhoff forceps draw the lens out *without pressing* on the globe. In the next eight cases I may not have such good results and I know eight cases count but little, but if one operator can extract lenses in this way without pressure all can do the same. The operation has come, extraction and not expression.

Preliminary iridectomy may answer one question of Dr. Gifford as to why in some of his cases the vitreous came in the first opera-

tion and not in the second. An iridectomy was done in the first operation and, therefore, not necessary in the second.

I want to recommend the book by Herbert on Cataract Extraction, in which he lays so much stress on educating the patient before going on the table and I want to recommend the operation of extracting the lens instead of expressing it.

DR. ARNOLD KNAPP, New York City: This is a very interesting subject; Dr. Gifford's conclusions, based on his large experience, are worth coming many miles to hear. I have backed out of three cataract operations so far as I can remember distinctly at this moment; they all had the following characteristics: first, an escape of vitreous on completing the section, a sinking back of the cataract with subluxation below, i. e., gaping on the wrong side for the extracting of the lens. If the case is that of a traumatic cataract and the other eye is normal, it is best to back out, otherwise dissection can be attempted as Dr. Gifford suggests. I remember one case in this connection: a man of 50 who came to the hospital with a phthisic eye on one side, after an unsuccessful extraction, and a mature cataract on the other. After completing the section vitreous commenced to ooze out, the sclera collapsed in the upper part and further operation was deferred; I decided to proceed with repeated dissections, which I practiced in the upper part of the lens capsule because that was the part most adherent. This had to be repeated a number of times. I then lost sight of the patient for a few months, when he came back with secondary glaucoma, the nucleus having escaped into the anterior chamber. It was then extracted, and the man obtained fair sight.

Will Dr. Gifford tell us what he means by a "sliding flap?"

DR. GIFFORD, Omaha, (closing discussion): Quite a number of ideas have been suggested to me. The sliding flap which Dr. Knapp asks about is one that has been referred to by many, first by Kuhnt, and then by Van Lint, and if I remember right, a couple of Frenchmen and Fox did this for some time. I have done it in perhaps two hundred cases, and Dr. Patton has done it in a large number also, for he does nothing else. This operation is as follows: You begin by dissecting up the upper half of the conjunctiva for a distance of rather more than half an inch outside the cornea. A very important thing before this is the process of cocaineization. A 10 per cent solution with a little adrenalin should be applied to the upper half of the conjunctiva, with a very small swab, four or five times in the course of 20-30 minutes. Then inject a drop of 4 per cent cocaine just below the cornea on each side. Then, having completed the dissection of your flap, put in a suture at each side about  $\frac{3}{16}$  above the horizontal meridian and take a good big bite on each side above and below, tie a preliminary knot with a double twist, and leave the suture loose enough to push to the side and give plenty of room; then make the incision just inside the limbus and do the expression in the ordinary way and tie your sutures. You then have the upper quarter of the cornea covered by the sliding flap. If you have had loss of vitreous you limit it to the minimum and do not have the gaping hole that keeps you awake at night. (Illustrates this at board.)

The management of sutures is one of the weak points in ophthalmic asepsis. To keep them from touching something that is not sterile the protecting gauze should extend well below the brow and should be stiff enough to stand well away from the globe. You can let your thread rest on this gauze without having it touch anything except the conjunctiva which you put it through.

As to the question of trouble with the nucleus. In the first case, the nucleus came forward into the anterior chamber, and the patient would have sharp attacks of pain lasting a day or two for some months. When the nucleus had dissolved a good deal, these attacks stopped. In the second case, the nucleus gradually disappeared without these attacks.

Dr. Greenwood opens up the question as to the prevention of the loss of vitreous. That is another story, as Kipling would say. He thinks this generally due to some fault of technic or of the knife which doubtless applies to some cases; but I do not think it the cause in most of these cases of mine. I think the eyes were pathologic. As to preliminary iridectomy as preventing the necessity for backing out: the history of two of my cases would indicate it would have an influence. As to advocating a preliminary iridectomy in all patients with only one eye, I should like to ask Dr. Greenwood why, if it is safer, it should not also be done in patients with two eyes? Put it up to your patients and say, here is a chance for you to get a better result if I do a preliminary operation. Do you say that to your patients?

Dr. GREENWOOD: Most of them. I explain it to many of them. You have to know your patients. I would rather give a patient a single operation if I can be justified, but I do not think the preliminary iridectomy where there is a single eye is wrong.

Dr. GIFFORD: I still insist that if you think a preliminary operation gives a patient with one eye a better chance, it is your bounden duty to tell the patient that this divided operation will give a better chance than the single operation; will you have it or not? That is the only alternative.

## FOCAL ADJUSTMENT IN THE APHAKIAL EYE

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The first requisite for the acceptance of any theory is that all of the observed phenomena shall be completely in accord with the principles which have been affirmed. If any instance arises out of harmony with the theory enunciated and more especially if such instances are repeatedly noted, either the accuracy of the observations or the validity of the theory is then open to question. In adding one more to the already long list of cases in which a wide range of focal adaptation was found present in the absence of the mechanism to which that function is universally ascribed, the entire theory is challenged. If insistence is made, as it was by Donders, that "not a trace of accommodative power remains in the eye from which the crystalline lens has been removed, even in the young subject," then some other adequate explanation must be given for those cases in which a wide range of focal adaptation is found present. It is a curious non sequitur that Donders should specifically refer to the *young* subject, since according to the theory of Helmholtz which he accepted, that the power of accommodation is due to the inherent elasticity of the crystalline lens, in the absence of this lens it could make no difference whether the subject was young or old.

The purpose of this paper is not only to report a refractive anomaly which seems to controvert a generally accepted law in ocular physics, but as well to draw from it and others the deductions which would necessarily follow, and which lead to the conclusion that another element than that of the crystalline plays an important role in the normal process of accommodation.

On March 17th, 1920, I was consulted by W. H. M., who was suffering from a slight conjunctivitis following a severe fall from one floor of the shop in which he was employed to the other, which knocked out his front teeth and smashed his glasses. Although he could manage fairly well without them, they naturally improved his vision and he was anxious to have them replaced. He is 51 years old, of light complexion, heavy eyebrows on the nasal side of each eye, scant on the temporal sides, a strong vigorous man whose musculature is well developed and whose average weight is 175 pounds. He has blue eyes with

round pupils of about the size of those usual in light eyed people which is a little smaller than is found in those who are dark. He had been operated on both eyes for congenital cataract when a child by Alfred Graefe of Halle, first in 1872 and again in both eyes for secondary operations on the capsules in 1878.

It is rather interesting in this connection to recall that it was Albrecht von Graefe, the cousin of Alfred (who operated on the case which I have to report) who suggested to Donders that accommodation *did* remain in the eye after the removal of the cataractous lens, and this led to the much discussed point of light experiment by the latter observer.

An examination revealed the following facts:

Without glasses, right vision equals  $5/200$ ths; left vision equals  $5/200$ ths.

Refraction: R. plus 10 D. Sph.  $\supset$  plus 1. D. Cyl axis 105 equals 20 20ths less 2. L. plus 9.50 D. Sph.  $\supset$  plus 1.25 D. Cyl axis 60 equals 20 20ths less 4.

Under dilation the pupil of the right eye is found to be slightly irregular because of adhesions on the inner and lower side leaving a small band of capsular tissue connected with the pupillary margin. Left pupil is round, the area clear as can be determined with the undilated pupil, the conjunctiva free from injection, irides tremulous throughout their entire extent. Ready contraction of the pupil to light, slight but marked contraction of the pupil in effort to accommodate. With O. U. plus 2 D. added to his distance glasses he reads more comfortably and easily and prefers the added correction for close work. With the ophthalmometer, the eye being at rest and the mires focused on either cornea, when an effort is made to look at a point within the opening of the tube, without change of direction of the axis of vision, there is a definite blurring of the image and the instrument must be advanced to what would be equivalent to about half of one diopter to make it clear again. In testing the eyes with a small point of light, the form of the light appears to be unchanged in the right eye by any focal effort. In the left eye it becomes slightly elongated.

With the distance correction unchanged in position before his eyes, he reads J. 1 at 7 inches with both eyes; with the left eye closed, he reads J. 1 at 9 inches and *after a few minutes effort*, can carry the print as far as eighteen inches and continue reading. As soon as the left eye is opened and he attempts binocular single vision he is able to bring the type back again to 7 inches. In using the right eye, without any glasses whatever, at short range

he closes the lids to a slit scarcely more than 2 millimeters wide, holding the reading matter to the left side of the nose so that he is looking diagonally over the nose and slightly downward over the printed page. With the right eye closed he at first reads with difficulty very large letters, *but the acuity gradually increases* until he is able to read 1.25 D. (about J. 4) at three inches. *The letters blur as he attempts to read but they become definitely clearer when he makes a conscious effort without change of position of the type.* The pupil does not change in size as the type becomes distinct. The ophthalmometer shows there is a slight change in the corneal curvature. How much, it is very difficult to say.

Now if a man 51 years old and having normal eyes were able with suitable distance correction only to read type of the fineness of J. 1 with an amplitude of accommodation extending from 18 inches to 7 inches, we would say that he had extraordinary ciliary power. In the absence of the crystalline lens, we naturally ask ourselves, through what means such a feat could be accomplished. If this were a unique occurrence it would be of great interest, but Davis has shown in a paper read before the American Ophthalmological Society of last year, that this is not only not unique but this same phenomenon has occurred in many instances even in a more marked degree and under the observation of men of such undoubted ability and veracity that the facts can no longer be questioned.

The title of Davis' paper, "Accommodation in the Lensless Eye," demands a moment's attention. It negates itself. If accommodation is the sole property of the crystalline lens then obviously in the absence of that lens there is no such function, and the affirmation of the presence of focal adaptation is an admission that it must be the result of the action of some other mechanism.

Neither can there be such a thing as a "*lensless*" human eye. The eye is itself a lens. The common habit of referring to the crystalline as the *lens* of the eye is a looseness of expression that ought not to continue. The eye is a teleomicroscope. Moreover, the most important lens is not the crystalline because the eye can exist and function satisfactorily without it. The essential lens is the *vitreous* which with the cornea and the aqueous constitute a lens of about eight times the strength of the crystalline.

This is not the hypercriticism of a purist in language, important as it always is to use exact terms of expression, but it is urged because the term commonly applied of the vitreous *body* leads the

mind away from the essential fact, that it is not a simple homogenous mass supporting the retina, through which the rays acted upon by the crystalline are focused, but that it is itself an active agent in the accommodative process and an essential part in the combined lenticular system.

In his valuable paper of last year, Davis supplements another on the same subject read in 1895 in which he reported two former cases having like focal powers in the absence of the crystalline lens and summarized the literature up to that date. In his more recent paper he very completely reviews the entire subject, and in the report of his case as well as in the discussion that followed, the existence of the phenomenon, although infrequent, was verified beyond question. In some of the cases, particularly in that of Loring, the focal control was amazing. This discussion of the subject was so complete and recent that it is easily within the memory and reach of those who are interested, so it will not be necessary even to summarize it. To substantiate the case which I am reporting the patient was seen by several very competent ophthalmologists including Starr, Blaauw, Glosser, and others who assisted in determining that the facts were as reported. He was then taken before the Buffalo Ophthalmological Club and a further demonstration was made, so that there were at least 20 competent observers who assured themselves that the facts were as given. The facts must now be accepted as fully authenticated. It only remains to determine whether any explanation can be given that will be in harmony with our accepted ideas as to the manner in which this faculty is effected. In the discussion before either the Buffalo Ophthalmological Club or the American Ophthalmological Society, no absolutely definite conclusion was reached. A number of opinions were offered and four reasons were given which were considered in some measure to explain how this anomalous action was produced.

First, the smallness of the pupil; in practically all of the cases either a relatively small pupil or a slit in the capsule was found present.

Second, it was considered that it might be dependent upon the larger size of the retinal images due to the absence of the lens.

Third, that it was an acquired power of interpreting the circles of dispersion and,

Fourth, that by the tilting of a strong plus glass the monochromatic aberration was neutralized and the ability to interpret the images increased.

But none of these explanations would seem to be valid. It can



be readily demonstrated that a small pupil is not sufficient in itself to produce the results which have been shown to be present. If this were the cause of the increased focal range it would have great practical importance. It would justify Tscherning's conclusion that a refractive examination with a pupil widely dilated is less accurate than one with a small pupil. It would suggest the advantage of placing a perforated diaphragm with a small opening before the trial lens when a refractive test is being made. It would be a forceful argument for the more common employment of the simple extraction of cataract as the preservation of the iris intact would not only have an asthetic value but would be of increased visual importance as well.

There can be no question that by cutting off the marginal rays, the clearness of vision is in some measure increased, although it would have no influence, whatever, on the range of accommodation. I may say I have greatly improved the comfort of cataract patients by placing a correcting lens in the center of an aluminum disc having a diameter of 4 millimeters instead of using the large lens commonly employed. One patient whose eyes grew readily tired with the old correction was enabled to read for hours by means of this device, but a small pupil is not a pinhole pupil and that this range of focal adaptation, which is occasionally observed, cannot be dependent upon a pupil  $1\frac{1}{2}$  to 2 millimeters in diameter can be readily demonstrated. It would be necessary only to place a diaphragm perforated with an opening of that size before the correction lens of any patient who had been operated for cataract, and an increased range of focal adaptation would be immediately secured. We know that this cannot be done. We can also eliminate as an explanation any special ability to read fine print either by training or by cutting off the dispersion circles, because one cannot interpret fine print, other than by distinctly seeing it. There might be some basis for the suggestion that by training the visual sense from childhood the aphakial eye might be made to see smaller images than would be possible when the lens had been removed from the eye of an adult, but the question naturally arises, of *what* muscles and *how* could such an effect be produced. All of these explanations would apply equally to every case of cataract that had been operated on successfully, in which the same conditions either were normally present or artificially produced. Cases like these under consideration occur with such infrequency that they have been reported as unusual and extraordinary. Some other element must enter into the con-

dition than that which has so far been noted. In physics there must be a physical explanation of physical phenomena.

Nature is not prodigal in duplicating her methods. If in any of the lower animals and birds a simple measure accomplishes the desired object, the same general plan with perhaps more complicated apparatus is used to achieve a like end in the higher forms of life.

In the eye of an ox it is found that by carefully cutting off the cornea and removing the iris and then with a probe breaking away the adhesions of the ciliary, the entire intraocular structures including the choroid come out en masse. The adhesions between the capsular ligaments, the patellar fossa and the vitreous are firm ones. After then carefully removing the choroid, the iris and the retina, it will be seen that the entire lenticular system is joined together. The fibres of the suspensory ligaments are not lying loosely on the hyaloid membrane but are incorporated in it and extend far back into its substance and it is only by breaking them at the lenticular ring that the lens can be loosened. The attachments then are at the chorio-scleral junction at the margin of the lens and to the hyaloid membrane. The tractive power necessary to change the curvature of the lens, if it were required, would be very great, whereas, the power to pull the vitreous forward would be slight as the crystalline practically floats on the surface of the vitreous. Moreover, another important factor is brought to light in studying the structure of the vitreous. If the posterior portion of the eye of the ox is removed it will be seen that the vitreous appears to be absolutely homogenous. This is far from being the case. This can be determined by palpation. By applying the finger tip over the vitreous we find that it consists of two parts, an outer portion in which the density is very slight, and which is of a thin gelatinous consistency, and an inner portion which is relatively firm, elastic in feel and in which the difference between the central firmer portion and the outer thinner portion is readily detected by palpation; the outer portion of the vitreous body occupies a space of about from 2 to  $2\frac{1}{2}$  millimeters completely surrounding the firmer central portion. When this is extruded through an opening in the eyeball we find that it takes on a definite lenticular form. If the entire mass is taken from the eyeball, in a short time the more watery structure runs away, leaving the denser portion behind. There exists, at least in the eye of the ox, within the vitreous body a vitreous lens, which together in its adjustment with the crystalline makes a compound lenticular system, through which

all of the functions of vision may be performed with the least amount of effort. (Refer to Plate No. 1.)

In the eye of the rabbit the lens is almost spherical and the amount of vitreous outside of it is very small. There would seem to be nothing gained in that case by a change of curvature. Wood and Slonaker have shown in certain birds, notably the sparrow, the anterior-posterior length of the whole eyeball, including the cornea, lens and vitreous, is shortened during accommodation. In the amphibians the eye is adapted for infinity and

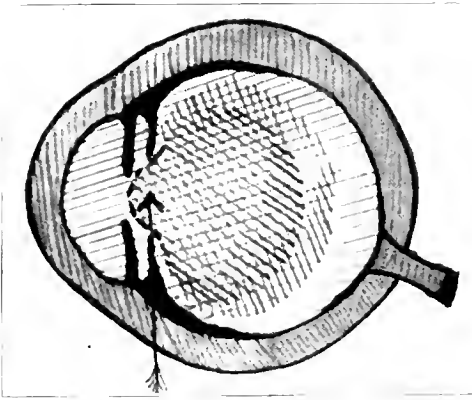


Plate 1

#### Lenticonus Produced by Pressure in Absence of Lens

The ciliary muscle fibres are attached to the suprachoroida, exerting traction on the vitreous lens. In the absence of the crystalline lens in the exceptional cases, the combination of the extrinsic and intrinsic muscles push forward the vitreous lens and give it the form of a lenticonus, thereby developing a range of focal adaptation.

is accommodated for near vision without change of curvature of the lens. The lens is pushed forward by the compression of the vitreous body. Wood in his exceptionally fine article on Comparative Ophthalmology says "that the action of the lens which is true of birds and of some mammals is not applicable to man," and he puts in the qualifying phrase, "if the Helmholtz theory be accepted."

In the human eye there would seem to be very much the same density in the center of the vitreous as is found in the eye of the ox, but as the number of perfect human eyes which can be obtained for dissection is so limited this fact cannot be at present determined. Now if the mechanism in the human eye resembles that of the ox, an explanation can then very readily be made of the presence of focal adaptation in the absence of the crystalline

lens. There would be left the lens of the vitreous which coming up to the pupil would be pressed upon by the ciliary muscle, the retraction of its margins against the vitreous body would force the anterior surface forward, giving it an increased curvature.

A very similar process, as Hess has shown, occurs in the eyes of reptiles and birds whose extremely plastic lens is forced into a conical projection bulging through the pupil, thereby increasing its refractive power. This might easily occur in the plastic vitreous after the removal of the crystalline lens, as the external muscles in conjunction with the ciliary attachment to the supra-choroidea are strong enough to give the necessary pressure. There is reason to believe in these unusual cases that that is precisely what occurs. In the case which I have reported the musculature of the man was exceedingly strong. He had in all probability trained his eye muscles so that there was marked pressure on the sclera in the act of convergence. There could even be direct pressure on the vitreous through the action of the ciliary, from the same impulse that caused convergence. I refer briefly to the experiments made by Hensen and Voelckers so often reported but never seemingly reproduced, which have demonstrated the segmental action of the ciliary muscle because when any single ciliary nerve fiber was irritated, "contraction of the iris and the ciliary muscles and the advancement of the choroid takes place only in one isolated portion, thereby making possible astigmatic correction."

Savage approves the theory of segmental action of the ciliary when he says, "It may also happen that a corneal astigmatism may be in part or wholly offset by a lenticular condition of tilting of the lens such as that just discussed through the agency of the action of the individual fibres of Bowman's muscle."

In a paper read before this Academy in 1905 entitled "The Ciliary Process in Accommodation," I said, "The long fibres of the ciliary muscle are attached anteriorly in the sclero-corneal tissue constituting the boundary wall of Schlemm's canal. They are attached posteriorly to the choroid. The fibres of Müller form the angular ring beneath those of Bowman."

The physiologic action which follows would almost seem obvious. A contraction of the long fibres relaxes the zonule. Coincidentally with this, the circular fibres surrounding the margin of the iris contract, impeding the free venous flow and causing the ciliary processes to become turgid, with blood; they in turn pressing, by their bulk, on the anterior part of the suspensory ligament of necessity flatten the edges and protrude

the center of the lens in exactly the form that catoptric tests have shown to be present.

Accommodation having been completed, the muscles relax allowing the vessels which had been full, to empty, in all probability in doing so allowing the overflow to pass into Schlemm's canal.

It will be evident from this that as the artery leads by way of a very large capillary into the anastomosing mass of veins

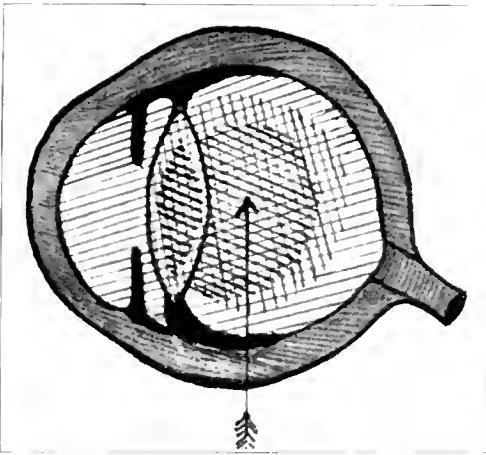


Plate 2

#### Vitreous Lens Portion of Greatest Density

In the presence of the crystalline lens the traction on the suprachoroidea relaxes the ciliary bodies which fill with blood, as erectile tissues. The same effort forces forward the vitreous lens, which presses against the posterior part of the crystalline lens, its denser portion pushing forward the more plastic part in a lenticonus of the curve necessary to meet the focal requirements. Its relaxation allows the blood from the ciliary bodies to flow into Schlemm's canal, the vitreous lens slips back and the crystalline resumes its normal curve for the eye at rest.

the passage of blood into the capillary processes is practically unimpeded. That an increase in bulk in the ciliary region occurs in accommodation, has been noted by Tscherning who does not ascribe it, however, to the cause which I have given. He says, "There is formed during accommodation at the anterior surface of the iris a circular depression—the peripheral border of which corresponding to the ciliary body rises in a peak, while the central border presents a very gentle slope corresponding to the anterior surface of the crystalline lens."

It is now possible to add to this the further observation that

the action of the ciliary muscle through its traction on the hyaloid membrane, forces forward the lens of the vitreous, this pressing against the crystalline lens, forcing the denser nucleus against the more plastic cortex and causing the anterior part of the crystalline to protrude to just the degree needed to give the required focal length. The action produced in this way is in perfect harmony with all of the observed facts. It is accomplished easily, quickly, and under normal conditions without strain. (Refer to Plate No. 2. The plates were very kindly made for me by Dr. W. H. Phillips.)

The segmental action of the ciliary muscle, explains in the only possible way the production and the correction of lenticular astigmatia. It is the only reasonable explanation of the existence of focal adaptation in the absence of the crystalline lens. It makes clear the pathology of the softening of the ocular structures in malignant myopia and of the changes occurring in progressive corneal astigmatia. The acceptance of this new theory will require the writing of a new ocular pathology based upon a fuller understanding of the actual changes which occur in the accommodation in the human eye.

#### DISCUSSION

DR. H. A. SMITH, Delta, Colorado: I will report a case of a boy of eleven years of age with both lens entirely removed; slight opacity remaining in one eye. He wears a 9 plus for all occasions, study, play, ball, etc.

DR. J. A. DONOVAN, Butte, Mont.: In 1910 I removed both lenses from a boy, age thirteen years, traumatic cataracts from an explosion. With +5.00 S. combined with +5.50 cyl., vision of right eye is 20/20. With +5.50 S. combined with +5.00 cyl., vision of left eye is 20/20. He uses these glasses exclusively for all work with complete satisfaction.

DR. W. K. FRINGER, Rockford, Ill.: About 20 years ago I did an extraction on a woman in the early fifties, doing a preliminary iridectomy and extraction. I refracted her for distance getting 20/20 vision and told her to come in in a short time and I would give her glasses for near reading. When she returned she said she did not need glasses for reading, as she could read with what she had. Could thread a needle and read fine print at a comfortable distance. In about the second year I operated on the second eye, doing a preliminary iridectomy and extraction, and got about 20/30 in the second eye. She had the same power in the second eye, using the same glass for both distance and near for about ten years, and made no complaint about close work. Then she came in complaining she was not able to read long, and I gave her a correction of  $2\frac{1}{2}$  or 3 added to her distant correction. I wish to state that the distant vision had not decreased any at that time. Had no myopia. At

no time wore less than plus 10, with the addition of weak cylinders.

I regret that I am making this report entirely from memory. My program of this meeting was so late in coming that I did not have the opportunity, before leaving, to refer to my notes of this case.

DR. MEYER WIENER, St. Louis: One might conceive of a case where the lens had been removed, the posterior capsule holding the vitreous back. If the theory of Channing holds good, the ciliary process will push backward, and I think one can have a difference in the refractive power of the eye by pushing forward of the vitreous. Snyder made some experiments and had a specimen of a child which showed the actual bulging forward during accommodation.

DR. HARRY GRADLE, Chicago: I want to ask a few questions. If the pupil is dilated with a substance which in the normal eye has no effect upon accommodation, as, for example, dextrohyoscyanin, then have you tried the effect of putting an artificial coloboma over the eye? (Illustrates).

DR. H. W. WOODRUFF, Joliet, Ill.: Has the question of the lid muscles been considered in the change in the shape of the globe?

DR. LEWIS, (closing discussion): The question of the lid muscles was carefully considered in determining the method by which the focal changes were effected in this case. It is true that when my patient tried to see without his glasses the lids were narrowed to a slit and he looked diagonally over the nose and then was able to make out letters of the size of what is termed 2-line English which is larger than any of the Jaeger letters, but with his distance glasses he was able to read Jaeger 1 without any contraction of the lids and with perfect readiness. A pinhole pupil, of course, does increase the clearness of the letters but in this case we were not dealing with a pinhole pupil, but with one that was from  $1\frac{1}{2}$  to 2 millimeters in diameter.

In answer to Dr. Harry Gradle's question I may say that it was quite impossible to get any reflection from the anterior surface of the vitreous. If it be a fact, as there now seems to be no doubt, that we do get focal changes in the absence of the lens, it negatives the conclusions of both Hemholtz and Tscherning and opens an entire new field of research. It is most important for us to know what actually does take place in the process of accommodation, because upon this is dependent not only our refractive results but an understanding of the deeper diseases which may be brought about by strain upon the hyaloid membrane of the vitreous.

We are only beginning to appreciate the importance of the vitreous. A study of its actual structure has been too long neglected. The length of my paper has permitted me only to outline what I had in my mind to say and to indicate some of the studies that I have been making. I trust this whole subject may be restudied and I will be grateful for reports of any cases which have a bearing upon it.

## PRIMARY EPIBULBAR CARCINOMA

F. PHINIZY CALHOUN, M.D.

ATLANTA, GA.

The subject of epibulbar carcinoma is ever an interesting one, and the following case offers some features which seem worthy of recording.

D. McC., age 64, a farmer and merchant of Mississippi, was seen in 1914, complaining of defective vision in the left eye, but more especially of a tumor formation of long standing in the left lower lid, which recently had rapidly grown in size.

There is no history of cancer in the family, and the patient's father died in his eighty-fourth year from "old age." His mother died of tuberculosis in middle life and there is also a sister who died of the same malady. The other members of his family are living and reported to be healthy.

The patient states that with the exception of two attacks of influenza he has been remarkably healthy and has always led an active out-of-door life.

His vision had been good until eighteen years ago, when "wild hairs" caused considerable irritation to his eyes. A pterygium was removed from the left eye, and two years afterwards a growth developed on the globe of the same eye, which was pronounced malignant. Later he states that an Eastern confrère of note expressed an opposite opinion after the bulbar growth had been entirely removed at this last consultation. The eye remained quiet until six weeks before he came under my observation, when, noticing a tumor formation in the lower lid, the patient again consulted a surgeon in a neighboring city. From the statement which I received, the growth was evidently mistaken for a granulating chalazion, as an attempt was made to incise and curette it, which operation caused the growth to enlarge.

A physical examination of the abdominal and thoracic viscera did not reveal anything abnormal, yet the man was decidedly under weight. An examination of the blood and urine showed that they were within normal limits for one of his age. On the left side of his neck, the right shoulder and dorsal surface of the left hand were small dry epitheliomatous areas which had been present many years.



Eye examination: O. D.  $20/40 + 2.00 \times 45 = 20/20$ . There was a slight drooping of the upper lid and the conjunctiva showed a few scars from an old trachoma. There was seen a small corneal scar at the nasal limbus, evidently the remnant of an atrophic pterygium. The fundus and tension was normal. O. S.  $18/200$ . The upper lid drooped considerably, there was a decided entropion and most of the lashes were missing from epilation. There was a small peripheral corneal scar from a pterygium operation, and the cornea was well covered with an avascular pannus. The conjunctiva of the upper lid showed trachomatous scars. The cul-de-sac of the lower lid was completely obliterated by a tumor about the size of a hazel nut, which was firmly attached to the sclera, and the globe could be moved by any motion of the tumor. The upper limit of the growth was slightly above the lower limbus line and there were evidences of recent instrumentation. The integument was freely movable over the tumor and when the lids were gently closed the external appearance was that of a large chalazion.

Being of the opinion that the tumor was malignant, I urged that an enucleation be done if a pathologic report confirmed the clinical diagnosis, which he positively refused. He only desired the removal of the growth, which was performed under ether anesthesia.

The growth was easily exposed, and to my surprise, it readily "shelled out" from its scleral attachment. No effort was made to close over the raw surface.

Two days later I received the report that the tumor was carcinoma, and I suggested the application of radium. A tube containing 20 mg. was applied to the raw surface of the lid for an hour and thirty minutes. As there was no reaction, another application for two hours was made two weeks later, and again repeated in two weeks for two and a half hours with an intense reaction to the lids and globe. The edema subsided entirely in six days, when the patient was temporarily dismissed. Marked contraction was taking place in the lower lid, with the lid firmly adherent to the globe.

Two months later the patient returned for observation and the vision had improved to  $20/70$ ; the cornea was remarkably clear, and there was no indication of a recurrence of the growth. The fundus was normal.

One year later the patient discovered an enlargement in

front of the left ear and he was advised to return for observation. The condition then was as follows:

Marked drooping of the upper lid with a few lashes which had not been epilated. The pannus had returned, and encroaching on the lower fifth of the cornea from each side of the medial line, there was a pterygium-like growth of the conjunctiva. The lower lid was adherent to the globe, and at the site of the original growth there could be felt a slight elevation about the size of a large grain of rice. Situated beneath the skin in front of the tragus of the left ear was a movable gland.

I again urged an enucleation, which the patient again refused, and he was content with the removal of the recurrent growth and gland, both of which were done under local anesthesia. The wounds healed nicely, and shortly afterwards he was dismissed.

I have kept close observation of the case, confidently expecting a return of the original growth and a metastasis, but he was seen in April, 1920, over six years after the first operation, and the eye was quiet except for the complication of a chronic trachoma.

As the original growth had been so readily removed, I had doubted the correctness of my diagnosis, and as I had not wished to risk solely my opinion and that of the pathologist as to its malignancy, I had sent sections to three other pathologists of wider experience, all of whom had unhesitatingly concurred in the same diagnosis. The report of Dr. George S. Dixon, of the New York Eye and Ear Infirmary, in part was as follows:

"The sections show an alveolar stroma of connective tissue filled with epithelial cells of the basal variety after the manner of true carcinoma. The connective tissue has undergone mucoid degeneration to a considerable extent, and where this has not occurred the stroma holds a fair number of small round and lymphoid cells. Vessels are not very numerous, and there is some epithelial degeneration within the alveoli.

"Diagnosis: Carcinoma myxomatoides.

"The recurrent tissue shows the same general characteristics, but without the mucoid degeneration of the connective tissue stroma, more irritation and less epithelial degeneration possibly owing to being a younger growth than the original—given the same time the same degeneration would doubtless

occur. There is a small amount of scleral tissue attached to one border of this growth.

"The preauricular gland is a metastatic growth. It measured 9.5x11.5x12.5 mm. Of course the preauricular gland is normally very small, but there are so few lymphoid cells remaining in this specimen (and they are just under the capsule) that it seems evident a considerable number have been absorbed. Practically the entire tumor is carcinomatous, and of the same character as the tumor of the lid without its degeneration. The cells here are younger, densely packed in the alveoli and in very good condition as compared with those of the other two specimens. The connective tissue stroma is rather scanty."

The clinical diagnosis of primary epibulbar carcinoma was confirmed by pathologic examination, and more than likely its origin was in the conjunctiva at the limbus, for as is well known, where one kind of epithelium passes into another, as such is the case in the epithelium of the cornea and conjunctiva, it is a favorite site for epitheliomatous growths. A pterygium operation antedating the growth of the tumor by about two years and the irritation of the globe from ingrowing cilia, may have had their influence in the development of the neoplasm.

As to the question of the invasion of the globe, many authors are at variance in their views, as for instance, Axenfeld, Greeff and Saemisch believe the eyeball is rarely penetrated, while a contrary opinion is expressed by Parsons and de Schweinitz. The latter proved that perforation does take place in a considerable number of cases, especially if the growth is of long duration, for he showed that in fifty-three reported cases perforation occurred in twenty cases, or 37.7 per cent. When the globe is invaded it is along the perivascular and perineural lymph spaces of the corneo-sclerotic junction, never elsewhere, says Parsons.

The proper surgical procedure in any case of epibulbar carcinoma is to me always a matter of grave concern, and the dictum of de Schweinitz is one worth remembering: that is, if the growth is small and situated at the limbus, a deep excision may be made, but the case closely watched for developments. Whereas, a larger growth removed from the limbus may be excised with greater safety, as it is further away from the penetrating ciliary vessels.

While a lymphatic glandular involvement is not a common occurrence (the preauricular first affected and later the sub-maxillary), it is usually regarded as an absolute indication for an enucleation or a more radical operation in the orbit.

A point of interest in this and other cases is the slowness with which these malignant tumors develop. Irritation from cauterization or palliative surgery apparently excites their growth.

In regard to the treatment with radium of carcinomatous areas of the lid after the excision of the growth, it is now a procedure often employed. While the end results of treatment in this case have been satisfactory, radium may have had its influence in arresting the development of new cells as well as the clearing up of the cornea which temporarily gave better vision. Similar changes have been noted in trachomatous eyes where the cornea had received radium exposures.

My experience in this one case had led me to draw the following conclusions:

- (1) Conservative surgery is indicated when the epibulbar growth is remote from the limbus, even though it may be large.
- (2) A preauricular glandular enlargement is not a serious complication as long as the lid tissues are not breaking down.
- (3) Radium or other similar rays may be of value as an agent against recurrence when used early after the operation.

#### DISCUSSION

DR. HARRY GRADLE, Chicago: In carcinoma affecting the eye we have a condition which in one sense may be called simple as opposed to the extremely malignant tumor in other locations. Any carcinoma within the eyeball is always metastatic and secondary, and we take a greater chance by removing the carcinoma by conservative surgery than if we were dealing with the other sort of tumor. In dealing with an epibulbar carcinoma we have a better prognosis than in some of the other types considered less malignant. I have had no personal experience. At the Boston meeting I illustrated a retrobulbar carcinoma involving the optic nerve.

I think Dr. Calhoun is justified in conservative surgery to be employed as far as possible followed by radiation, either with radium or X-ray. The paper is so complete that it leaves a speaker very little to talk about unless he has had cases of this kind, and there is little I could add to the excellent paper.

DR. JOS. LICHTENBERG, Kansas City, Mo.: I wish to report one case. This was Dr. H. P., living in Kansas City, age 83, who consulted me in 1918. In the left eye a little pain and difficulty of vision. Examination showed a mass in the upper inner quarter of the globe, adjacent to the

limbus, about 10 mm. along the limbus, triangular in shape, the apex 5 mm. back of the limbus, rising  $2\frac{1}{2}$  mm. A tentative diagnosis of malignancy was made. We dissected off the conjunctiva with the idea that if this was malignancy it was to be treated with the radium as recommended and this was examined under the microscope and proved to be a typical carcinoma. This was treated with radium in the hands of C. McDonald and the eye became fairly comfortable. Four months ago when I lost sight of him, there was a slight elevation in the region of the tumor. There is to be considered the age of the patient, the probability that it was of but a few months duration, and the fact he is doing well under radium treatment.

DR. WM. H. CRISP, Denver: In 1916 I reported a case of histologically typical epithelioma at the limbus just outside the corneal area, measuring about 4 mm. horizontally by 5 mm. vertically, and 2 mm. in depth. It had been coming on for a month or two only, according to the patient. It was followed for two years after removal of the growth and there was no return. All I did was to make as thorough an excision as possible down to the scleral tissue, curetting and cauterizing the base.

DR. F. P. LEWIS, Buffalo: Ten years ago I removed a carcinoma from the sclero-corneal margin of an elderly man. It was excised and scraped. The diagnosis was made from the tissue at the Institute for Malignant Diseases. Enucleation had been recommended although the eye had useful sight. At the end of three years there had been no return of the growth. It simply demonstrates that these things are not always as incorrigible as they appear. In incurable cases, Bulkley's teaching in the matter of diet are worth remembering.

DR. H. GIFFORD, Omaha: I have had six or seven cases of these most of them closely involving the cornea as well as the conjunctiva. Before radium was in use I usually got very good results by dissecting back and then using the electrocautery freely over the whole surface, and I have been amazed to see how well the cornea has borne this. Hardly any scar left from the use of the cautery in such cases, and in all the cases I have seen the result has been good except in one; in that case the tumor had penetrated along the vessels at the sclero-corneal junction, so there was a recurrence.

Radium will kill a lot of these without surgical interference, but without a man expert with the radium, you are liable to injure the cornea. I have in mind a case in which the patient's one eye was treated in this way for a carcinoma of the margin of the lid. It cured the carcinoma, but she had an ulcer that took in the center of the cornea, the upper and outer quarter, and vision down to 10/200, and the radiologist and myself were, threatened with suit for malpractice. The thing cleared up after a while. The patient finally came out with vision something like 20/30.

## OBSERVATIONS ON THE NEGATIVE PHASE OF CONTAGION IN TRACHOMA.

H. B. YOUNG, A.M., M.D.

BURLINGTON, IOWA.

Contagious, or not contagious? That's the question in trachoma; and until the etiology is definitely established it will doubtless remain the rule to advise a strict adherence to the precautionary measures in vogue with those who lean to the affirmative answer. That this course, outside of a regard for common cleanliness, is more a matter of suspicion than of conviction goes without saying; because the negative phase emerges from an intimate study of the history no less than from a recognition of the collateral facts that a specific trachoma germ is the despair of pathologists, and experimental propagation through direct inoculation has proven nothing.

The fundamental and outstanding fact in the history is that trachoma is preeminently a disease of agricultural life; rarely seen in high altitudes; common along the lower reaches of water courses, particularly in warm countries like Egypt and India; but, proportionately to the population, of type, similarly in evidence along European and American rivers. Not confined exclusively to agricultural life, it seems nevertheless to flourish only in those environments partaking largely of its two peculiarly associate burdens, viz: filth and flies. Filth and flies, therefore, whatever the avocation, play no inconsiderable role in its propagation; and inasmuch as filth from decaying animal and vegetable matter, plus the animal excreta, may be found on the high plateaus where trachoma and flies are alike practically unknown, the role of filth is manifestly subsidiary to that of the flies, whose predilection for close contact with trachoma victims has been so often noted.

Under these conditions, and the more especially since the paths of communication hitherto explored have all ended in blind alleys, it should not be forgotten that the fly, so long suspected as the common carrier, may in reality be the intermediary host. The etiology of yellow fever was originally based on circumstantial evidence whose adequacy rested mainly on a single analogy. But Findlay was right; and while he could point only to the *Anopheles* and malaria, we now have the records of the *Stegomyia*, the Tsetse, the rat flea, and the "Cootie."

To those of us who have long been on the "firing line" this solution of the problem will doubtless make a stronger appeal than to the younger men, because we have seen the disease confined to narrower and narrower limits, and to a degree not accounted for by any sanitary measure inaugurated to that end. Personally I should like to believe that my many words of caution, in relation to interhuman contact, had carried conviction to the masses in contiguous territory; but by no stretch of the imagination can I thus explain the fact that I do not now see as many trachoma cases in a year as I saw in the average month of the first decade (1880-1890) of my work in Burlington. Nor is it because I was then the only worker in this field; for my colleagues of subsequent years tell me that they see trachoma only at long intervals. In these 40 years, however, there has also been an amazing change in living conditions. With the advent of comparative wealth, which in this country has been the common reward of intelligent effort, more interest has been taken and larger investments made in those things generically known as home comforts. Among these the screens for windows and doors easily hold the premier position. To think of a house now is to presuppose screens, save in certain delimited localities where primitive ways still prevail; and if we desire a measure of their importance in the domestic economy, we may take the statement recently made by a lady in my presence, viz: "As between my screened porch and my automobile, the former gives the greater satisfaction." Perhaps she could recall, as I can, the days when there was only the many tailed paper fly-brush to give halfway comfort at meal time. Adopted in the first place solely for personal comfort, the screen has incidentally become the one sanitary requirement beyond popular criticism; and it is a remarkable fact, seemingly more than coincidence because trachoma still flourishes in fly-ridden communities, that the retreat of trachoma may be measured by the advance of the screen. This fact, moreover, can be demonstrated in the smaller area of the infected family even more conclusively than in the community. I make this statement with confidence because my long service in a typical field has given me, as perhaps to a few only, the opportunity to employ that best of all methods for securing conclusive data, viz: the "follow up" to the ultimate results; and upon my findings herein I base my faith in the potency of screens for the future as well as the past control of trachoma,—just as in yellow fever, and probably for the same reason. Here are some illustrative family histories:

I have known the H. family through four generations. Originally it consisted of man, wife and 14 children. The man was a R. R. contractor who acquired trachoma in a construction camp. His wife and the first four children were in turn infected. Twins came next; one infected, the other not. The following eight went scot free. In due time the oldest girl married and bore several children. Her husband was manager of a sash, door and screen factory; and neither husband nor children were infected. Then the second girl married a farmer and bore two children. The elder only, a son, was infected. Although this son is now a grandfather I still see him for limited periods two or three times a year with the usual sequelae of incomplete cicatrization. I have seen his wife and children repeatedly, and the grandchild recently; not one infected. This man, of pure Irish blood, from moderate beginnings and rather convivial habits, has developed into an exemplary, successful and open-handed farmer. Rollicking in his younger days he still does not eschew innocent fun; so it is unthinkable that he should be *noli me tangere* among those of his own household.

The uncle of this man, the infected twin before mentioned, is also still my patient off and on because there is a spot on one lid that shows recrudescence from time to time; but, unlike the nephew's case, without corneal involvement in recent years. His family consists of a wife and one grown daughter; neither infected. Desk Sergeant of Police for many years, I take it that his necessary connection with the Health Department accounts for his claim, the only one of the kind I have heard, that he strictly observes the standard precautions. But as there have been 365 days in every one of the 20 years he has had a family, the possibility of occasional lapses must be considered.

I have known three generations of the B. family. Man, wife and two half-grown daughters were on my list of trachoma patients 30 years ago. In spite of rather desultory treatment, cicatrization was eventually obtained without actual entropion or great corneal damage. The girls now have families of their own, and neither husbands nor children have been infected. I see one or another of them every little while because they have errors of refraction, plus a lingering fear of something worse.

Mrs. R. and Mrs. S., sisters, had entropion 17 years ago, for which I then operated with reasonable success. Their trachoma seems to have been a collateral inheritance. The parents had no eye trouble, but a maternal uncle and aunt (whom I have never seen) had "chronic sore eyes," which my patients described as



"like their own." It is thus a question of how much propinquity. I still see the one or the other at irregular intervals because they both have distressing errors of refraction which, with over-use or indiscretions in diet, make for conjunctival irritation and general discomfort. Mrs. P., another sister, escaped infection. Mrs. S. has a husband and three children; none infected. Mrs. R. has a husband only, uninfected; and they both scout the idea of contagion, declaring that they have never taken any precautions, even using towels and basins indiscriminately all the twenty years of their married life.

These histories have not been especially selected in the common usage of that expression. Rather are they especially available through the more or less constant personal reminders I have had of their existence; and they can hardly be exceptional until someone furnishes a more rational explanation of the decadence of the disease under better living conditions, as generally recorded. They are, however, especially instructive in that they deal with ordinary people, all, save the H. family proper, identified with agricultural life; who by thrift have come up in the world, and as they have prospered have indulged more and more in home comforts,—from screens up to electric lights and steam heat. Then they show that with the augmented indulgence in these comforts the march of trachoma was *abruptly* stopped,—seldom, and then only under characteristic conditions, reaching the third generation, and not favored by the intimacies of the marriage relation, or the towel in common. When these histories are duplicated, as I am sure they can and will be by other observers, it is plain that the etiology of trachoma must be studied from an entirely new standpoint; and that will have within its purview a comprehensive survey of the fly as herein suggested. In saying this I am not unmindful of Eaton's recent confession of failure to establish a connection between equine conjunctivitis and trachoma through the tabanidae; but a faulty indictment always brings acquittal, no matter what the character of the accused. And that was undetermined.

What happens when any kind of fly bites the trachoma victim and then bites the uninfected is the thing we ought to know. The specific poison may lie in one of the tabanidae, or even the ubiquitous *musca domestica*, which will bite upon occasion (on a moist surface); either or both may be found in the unscreened house.

Briefly summed up the situation may be stated thus:  
The existence of a specific trachoma germ is a remote possi-

bility; where trachoma abounds, flies also abound; there is no proof that the fly by mere contact spreads the disease; there is no proof that it spreads through interhuman contact, statements of belief contrariwise verging on the chimerical; there is a marked recession where the good things of life prevail, so marked that it ceases abruptly to be a family disease; and along with this recession there has been inaugurated only one sanitary measure of significance, to wit: the war upon the fly.

## DISCUSSION

DR. J. A. STUCKY, Lexington, Ky.: Several of my conclusions about trachoma in the past twenty-five years have been rudely and ruthlessly shaken, and after more mature and careful observation, I am convinced this disease is positively and not negatively contagious. The apparent immunity of some eyes to the trachoma infection is inexplicable. To say that it is negatively contagious seems to me unwise if not dangerous.

Whether there is a difference in "the habitat of trachoma in the valleys of the world's greatest rivers" from that in the mountains and valleys in Kentucky I do not know. That "its decrease and amelioration is in proportion to the increase in the comforts of living," I agree; but this is true of all disease. Increased power of body resistance, decreased number and virulence of foci of infection are the results of comfort from hygienic living and sanitation.

That the number of cases of trachoma is rapidly decreasing is noteworthy, but my observations and conclusions are that trachoma, especially as we have it in Kentucky, stands as the most uncertain, treacherous and destructive disease in the category of ophthalmology. I have seen cases in lawyers ministers, merchants, housewives and children who have all their lives had every comfort of living as soon as these comforts and safeguards were approved. In these cases it could not have been a filth or fly borne origin.

The majority of the cases are naturally in the middle or sub-strata class, the poor.

I have looked carefully for years for unmistakable evidence that it is a fly borne disease, but have not sufficient evidence to warrant conclusions. That no specific germ or etiologic factor has been isolated does not positively classify it as being negatively contagious. For many years other diseases have been considered "negatively contagious," notably tuberculosis. I am convinced that trachoma is mysteriously and positively contagious, especially in the inflammatory stage, and until this positive etiologic factor is demonstrated it remains a humiliating reproach to our science and art.

DR. H. GIFFORD, Omaha: I had this disease myself. I gave it to myself. Once when operating on a case of atrophic trachoma my forceps slipped and a little drop got just the proper angle to go over my glasses and got into my eye and in seven days I developed a violent case of trachoma which took me over two years to get

rid of it. So I feel quite sure that the disease is directly contagious.

DR. WM. H. CRISP, Denver: Coming from a state in which trachoma is relatively unknown, it is presumptuous for me to express an opinion; but I have felt for some years that there was a good deal of doubt as to whether trachoma was a specific disease. That does not mean to say that it is not produced by infection. I believe it to be a symptom complex due to a variety of irritative conditions, some of which may be noninfectious. I can see very little in the screen theory. In England screens are unknown and flies are very plentiful, yet trachoma is not, I believe, a common disease in England. About seven years ago I reported in the *Ophthalmic Record* the case of a man who for fifteen years had suffered from a pretty thoroughly typical trachoma of both eyes the case having been so diagnosed by a number of competent ophthalmologists, and repeated operations having been performed by some of those ophthalmologists. When he came to me he had scarring of the cornea and of the upper lids, and a marked spasmodic closure of the eyelids. I treated him for some time by various methods. After a while Dr. Casey Wood happened to be in Denver, and as he was at that time greatly interested in excision of the tarsal plate for trachoma, I asked him to demonstrate the operation on the man at our county hospital. After the operation there was no marked improvement. During my vacation the man was in Dr. Jackson's hands for a short time. After my return my attention was attracted to the fact that the man had violent attacks of sneezing if exposed to bright daylight. He had a marked external deformity of the nose, which he attributed to having been thrown from a mule in boyhood. There was complete closure of the left nasal passage. At my instigation Dr. W. C. Bane, of Denver, took charge of the nasal condition and did a series of operations on the septum. After the operation there was marked improvement and then a slight relapse, but after two or three operations, which were necessary on account of the impossibility of adjusting the nasal condition at a single operation, this man, who had been troubled with the trachomatous disturbance for so many years obtained complete relief from all his symptoms although naturally a certain amount of refractive disturbance from scar tissue remained in the cornea.

At least two other cases of trachoma of quite typical appearance got well after removal of diseased teeth. In each of these there was well marked pannus.

DR. H. B. YOUNG, Burlington, Iowa, (closing discussion): When I offered this paper I wrote that whatever the fate of my argument the facts would speak for themselves; and it may not be inferred from what I have said herein that I will abandon the standard precautions. In spite, however, of the rather adverse comments on my argument, the case against the fly has not really suffered by comparison with that of interhuman contact. There may be such a thing as inherent immunity. But I do not see how it is possible for the families I have traced to have it in such quantity. I should like to know more about the successful propagation by inoculation

(quoted). I witnessed Snyder's work in this line several years ago; both animal and human inoculation. At first he thought he had succeeded, later he admitted failure. In this connection Dr. Gifford's personal experience may or may not be a valuable contribution. If he really had trachoma we have the incubation period. But I do not take the ordinary follicular conjunctivitis for trachoma; and in the absence of scar tissue, which I believe unavoidable in trachoma of two years duration, I would have to be skeptical.

I would like an explanation of the disappearance of trachoma in the families whose records I have given, as well as others that I could bring before you. The immunity must have had a common factor. I agree that the Rockefeller Foundation should take up the study of trachoma.

## BLEPHAROCHALASIS, WITH PTOSIS: REPORT OF A CASE

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The condition known as Blepharochalasis is sufficiently rare to warrant the report of even a single case. This name was suggested by Fuchs in 1896, when he reported a series of cases. The condition however had been recognized before and attention called to it by MacKenzie in 1854. A number of terms have been used to describe this condition, e. g., "Ptosis cutaneae," "Dermatolysis palpebrale," "Paupières en besac," "Pseudoleukemia lymphatica," and "Angiomegalie de paupières," but Blepharochalasis seems to be the most appropriate, as the word itself means, lid-relaxed; there certainly is a relaxed condition of the skin. The skin is thin, stretched, relaxed and falls into many small folds.

In 1913 W. B. Weidler of New York presented a comprehensive study on Blepharochalasis before the section on Ophthalmology of the A. M. A., reviewing the previous literature and adding two cases of his own. Since then Edward Stieren of Pittsburgh reported two cases in 1914 before the American Ophthalmological Society and in 1916 R. L. Randolph of Baltimore reported one case before the same society.

It is a condition of early life and usually found in girls between the age of eight and nineteen years. Weidler thinks there is some connection between the appearance of the menstrual period and the development of the condition known as Blepharochalasis. The concomitant appearance of this condition, however, with the menstrual function in some isolated cases is not sufficient to warrant the conclusion that it is a causative factor. It is false logic, in fact a case of *post hoc ergo propter hoc*. There may be, however, some relation between an angioneurotic edema and the development of this condition, for it seems that it may begin as an edema of the subcutaneous connective tissues, which later result in a loss of elasticity and a consequent stretching of the skin and an atrophy of the subcutaneous tissues of the lid. Just why it involves the upper lid only, no one has attempted to explain.

Figure 1 illustrates this condition of the skin with its redundancy and thin tissue-paper like appearance better than words can tell. In all of the cases heretofore reported, I believe, the condition has been bilateral and no complete ptosis. In the case about to be reported the condition was monolateral, with a complete ptosis, which raises the question whether or not ptosis is not always a concomitant condition in monolateral cases and absent in bilateral cases.



Fig. 1

Miss Ethel S., age 19 years, family history negative, has always lived on a farm, physical condition good, subsequent laboratory tests negative. Began to menstruate at fourteen years; at this time it was first noticed that the upper lid would swell at times with a slight droop, this droop gradually increasing so that it soon became complete. The left eye was negative.

It has been suggested by some writers that in this condi-

tion there is a hernia of orbital fat, so that the protrusion of the eye ball was measured by the exophthalmometer and the right eye, the one with the blepharochalasis was found to protrude 3 mm. beyond the left. Some months after the operation another reading was made and no protrusion or exophthalmos was evident.

The refraction of the eyes was as follows: R.V. = 20/100; 20/30 w + 1.75 D.S.; L.V. = 20/20; 20/20 w + 1.00 D.S.

On November 22nd, 1915, patient was operated by excising a crescent shaped piece of skin with the subcutaneous



Fig. 2

tissue and some orbital fat. The wound was stitched with interrupted sutures, seven in all. The middle suture was passed down into the tarsus of the lid. The healing was prompt and uneventful. The result after operation is shown in Fig. 2.

Microscopic examination—The excised section consisted of skin, subcutaneous tissue and adipose tissue. There was a

thickening of the stratum corneum with flat epithelial cells in many layers. There was an absence of adipose tissue in the corium and general atrophy of the papillae. The stratum reticulatum was deficient in elastic fibers, showing a general atrophy. There was wide separation of the fibers in the subcutaneous cellular tissue, suggesting a preexisting edema.

#### DISCUSSION

Dr W. H. Crisp of Denver: I have nothing to add to this paper. The case is very interesting clinically. I have not happened to see such a case myself.



TRANSACTIONS

OF THE

TWENTY-FIFTH ANNUAL MEETING

OF THE

American  
Academy of Ophthalmology  
and Oto-Laryngology

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OTO-LARYNGOLOGICAL DIVISION



## MULTIPLE AFFECTIONS OF THE LARYNX

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In nearly every State Board, Civil Service and final examination of undergraduates in Laryngology, the following question is usually propounded: "Give the differential diagnosis between Tuberculosis, Syphilis, Rhinoscleroma and Malignant Neoplasm of the Larynx."

Those of you who have had the pleasure of examining these papers are astounded at the clearness and positiveness of the differential diagnosis of these various affections of the larynx, and are greatly surprised at the ease with which the diagnosis is made by the student. Yet, when one is actually confronted with a case of laryngeal affection, at times it taxes our utmost ability to arrive at a positive conclusion. If one pursues most of the text-books, either recent or those written before our present laboratory assistance was available, he will be surprised at the meagerness of this subject. It is true that they go somewhat into detail describing a typically well advanced case and give a clear-cut differential diagnosis, yet when we attempt to apply these points to our clinical cases under observation, we are completely lost in making the symptoms fit our clinical findings. Very few, if any, of our recent text-books draw attention to the fact that we may have two or three of these conditions simultaneously in the same individual. But such occurrences are by no means infrequent if one searches for same. I will cite later a few cases to demonstrate these multiple affections. If we follow the teaching of one of our most eminent Chicago laryngologists, who recently at a meeting of the Chicago Laryngological Society made the following statement, "every laryngeal tumor which does not yield to antiluetic treatment is a malignant one," our task of differential diagnosis is made comparatively simple. But we know that etiologic factors other than lues and malignancy will cause obstruction of the larynx or give symptoms localized to the larynx.

The following are affections, in their order of frequency, which occur in our routine laryngeal practice at the North Chicago Hospital.

1. Malignancy, meaning carcinoma, as we have only had one case of sarcoma in our practice.

2. Tuberculosis.

3. Lues.

4. Nonmalignancy, polyps, fibroma, granuloma, cysts, etc.

5. Perichondritis.

6. Pachydermis.

7. Scleroderma.

8. Lupus.

9. Rhinoscleroma.

Actinomycosis has been reported, although we have never had a case.

The following symptoms are present more or less in all these affections of the larynx:

(1) Hoarseness, (2) difficulty in breathing, (3) pain, (4) irritation, (5) expectoration, (6) difficulty in deglutition.

The differentiation between sarcoma and carcinoma is extremely difficult without a microscopic examination. In the former condition there is in the beginning less pain and it may appear in earlier life than carcinoma, yet when fairly well developed, only the microscope can differentiate. At this point I desire to state that while we have had cases of mixed infections of carcinoma and tuberculosis, carcinoma and syphilis, tuberculosis and syphilis, sarcoma and syphilis, sarcoma and tuberculosis not necessarily of the larynx, we have never seen a case of carcinoma and sarcoma in the same individual, nor in the perusal of all the literature which I have had at my command recently have I found a double affection of carcinoma and sarcoma, yet I vaguely remember a case reported in the German literature some years ago where this was described.

There are certain clear-cut cases in which, upon direct laryngeal examination, physical examination and the history, a fairly accurate diagnosis can be made. But in most of the cases which are brought to the laryngologist's attention, diligent examination, aided by the most thorough laboratory technic, is necessary before a satisfactory diagnosis can be made.

All text-books and authors agree that the symptoms and the appearance of the larynx are dependent upon the portion of the larynx involved, and the amount of destruction of the normal anatomy which has taken place. They state that it is necessary to differentiate all the other conditions before

correct diagnosis can be made; in other words, a diagnosis by exclusion. One of the most concise tables of differential diagnosis of syphilis, carcinoma, lupus and tuberculosis which I have seen is found in the last edition of Diseases of the Nose and Throat, by our late Dr. D. Brayden Kyle, which I herewith cite.

Syphilis.	Carcinoma.	Tuberculosis.	Lupus.
Pain usually slight.	Pain constant, lancinating.	Pain severe on deglutition.	No pain.
Attacks any portion of larynx and ulcerates rapidly.	Attacks any portion of larynx and ulcerates more slowly than syphilis.	The favorite site is in the interarytenoid space on the base of the arytenoid cartilage, ulcerates slowly.	Attacks any portion, ulcerates very slowly.
Is rarely seen in the stage of induration, the first evidence being a clear cut deep ulcer.	The first appearance is that of a new growth occupying the laryngeal cavity, no ulcer.	Usually the first appearance is small spots of induration, which is rapidly followed by great edema.	Nodular masses.
Some induration around the ulcer, but usually very little edema.	The growth fills or encroaches on the laryngeal cavity.	Great edema of arytenoids.	Little or no edema.
Ulcer extends deeply, often involving cartilage.	Growth extends in all directions, involving all tissues in its course.	Ulcer extends laterally, but not deeply.	Very slow in progress, rarely observed.
Surface of ulcer covered by mucopurulent secretion and necrosed tissue.	Surface of growth covered by discharge.	Surface of ulcer covered by thick mucopurulent secretion and agglutinated mucus.	Little or no discharge.
Mucous membrane hyperemic and injected.	Mucous membrane hyperemic.	Mucous membrane pale.	Mucous membrane injected.
Laryngeal stenosis not common until cicatrization occurs.	Laryngeal stenosis quite common.	Laryngeal stenosis rarely occurs.	Slight stenosis.
General health unimpaired.	Early in disease no impairment, later a marked cachexia.	Health impaired previous to laryngeal involvement.	Very slight impairment of general health.
Frequently evidences of syphilitic disease in other tissues.	In primary laryngeal carcinoma no other involvement until later in the disease.	Previous and coincident pulmonary trouble common.	Frequently cutaneous manifestations.
Rapidly improves under the iodides.	Iodides have no influence on the course of the disease.	Iodides have no influence.	Iodides have no influence.

No mention is made of the Wassermann test.

If we study this table carefully, we find that most of our cases do not fit exactly in any of these columns, and each case must be a study unto itself.

If we have an individual with marked tuberculosis of the

lungs, running an afternoon temperature, sputum loaded with the tubercle bacillus, and upon examination find miliary tubercles on the free edge of the epiglottis, marked ulceration in the interarytenoid space, a pear-shaped edematous arytenoid, I do not believe anyone would hesitate to make a diagnosis of laryngeal tuberculosis. But which one of the findings just enumerated would exclude syphilis? Are we absolutely certain that there is not an infection with the spirillum pallidum complicating the above picture? For such a condition is not only possible, but does occur.

If we have an individual above the age of forty, who gives a history of gradually increasing hoarseness for some months, emaciation, pallor, general weakness and some pain in the larynx radiating into the tonsillar region and on into the ear, no cough, and upon inspection of the larynx we find a new growth occupying the laryngeal cavity, without any ulceration, would one hesitate to pronounce this a case of malignancy? I would say most emphatically no, yet I will present a history of a case showing all these symptoms which was proven to be a perichondritis of the larynx, and not malignant.

If we have an individual who comes with a history of a primary ulcer some months before, who has no particular pain in his larynx, a slight huskiness of voice, some irritation in his larynx, the expectoration a stringy tenacious sputum, and upon examination we find an irregular, sharp-cut ulcer with an inflammatory areola surrounding it, the shallow floor of the ulcer being covered with a yellow, bloody-tinged material containing perhaps some necrosed tissue, would we hesitate in diagnosing same syphilis of the larynx? These typical types are easy of diagnosis, yet how few of them do we meet in our routine practice. All the cases which I am going to report show a combination of the various affections simultaneously. In Morris Schmidt's book, *Krankheiten der oberen Luftwegen*, he cites a case of Zenker's in which the patient had tubercular laryngitis which became healed. Shortly afterward he developed a primary ulcer, followed by a luetic ulcer of the larynx, which readily yielded to K. I. and mercury. Some time later he further developed a true carcinoma from one of the luetic scars, from which he finally succumbed. Schmidt believes where there is a mixed infection of tuberculosis and lues, the lues is usually primary, as these luetic ulcers form a good lodging and breeding place for the tubercle bacillus.

The main point to which I desire to call your attention is that these various affections of the larynx do exist and we have not fulfilled our obligations to our patients if we do not avail ourselves of all means at our command to exclude any of the other conditions. For instance, if a patient presents himself with a history of hoarseness for some months, some pain and expectoration, and upon examination we find a clear-cut ulcer and a small tumor on one cord, or in fact anywhere within the laryngeal box, and we have a Wassermann made and find same positive, shall we proceed and make a diagnosis of laryngeal lues, or shall we proceed and try to rule out tuberculosis and malignancy by other laboratory methods? Surely we would follow the latter course if we have the true interest of our patient at heart.

How shall we proceed in our examination to determine an exact diagnosis in those laryngeal cases which come under our observation with a history of hoarseness of some months' duration, some irritation and cough, probably some loss of weight, with or without pain referable to the larynx?

Naturally, in some cases our history will give valuable aid, probably a history of a previous luetic infection, or a history of tuberculosis of the lungs. If the patient has an expectoration, this should be carefully examined for the tubercle bacillus and also for the spirocheta pallida. A physical examination of the chest is made by a skilled internist and the findings, either positive or negative, are of great value. A stereo-x-ray of the chest is made, as is also a stereo-x-ray of the larynx. The blood is then examined, both for a Wassermann reaction and a complete blood count, including a differential white count. In syphilis there is almost a normal blood picture, while in tuberculosis we get an anemia with an increase in the lymphocytes; in malignancy there is nothing abnormal, except in advanced cases, where we get a picture of anemia.

If the blood Wassermann is negative and our physical findings or history make us suspicious of lues, we invariably make a spinal fluid examination, often preceded by a provocative test. And lastly, usually under suspension laryngoscopy, we remove a small portion of the growth for a microscopic examination. After we have all these reports, we can with some degree of accuracy arrive at our diagnosis. While a detailed discussion of the treatment is not within the province of this paper, I shall refer to same in connection with my

report of cases. The first case which is deserving of our consideration in this report is as follows:

Case I. Mr. G. W., age 63 years. (August 22, 1919.) Coal miner; for past three months has had a feeling of soreness and hoarseness, occasionally shooting pains in right ear. Frequent occipital headache. At times pain on swallowing. Denies specific infection.

Examination shows vascular growth filling larynx; seems to be attached to right side of larynx, almost filling same. Blood taken for Wassermann.

August 23, 1919. Under suspension laryngoscopy several pieces of growth removed for microscopic examination.

September 2, 1919. A tracheotomy was necessary on account of difficulty in breathing. The Wassermann was negative and the microscopic examination report as follows: "Benign fibropapilloma." However, in places the epithelial plugs are slightly atypical, and hence a borderline condition.

The patient left for his home, as we did not desire to do anything further until he recovered from his tracheotomy operation. On December 22, 1919, he returned and we noted considerable pus discharge from the tube. Not much loss of weight; could swallow soft and solid foods without difficulty. Examination shows considerable growth in right ventricular band region.

December 23. Under suspension another section was removed, which the laboratory reported to be chronic granuloma with myxomatous degeneration. No evidence of malignancy. As one hundred milligrams of radium introduced for six hours had no effect upon the growth, we decided to do a laryngofissure. On December 30, 1919, under local anesthesia, an incision was made in middle line, extending from hyoid bone down to the tracheotomy opening. There was a tumor mass about the size of a large marble at the level of the hyoid bone. In attempting to remove same, it was opened and a large quantity of pus came out. Culture and smear taken. A portion of the pus sack removed for microscopic examination. Larynx not opened. This specimen was mostly connective tissue, with some round cell infiltration. Following this operation, he developed a cellulitis and a large abscess of the neck. This was opened and drained.

January 12, 1920. Patient had a chill, followed by high temperature, and later complained of pain in right hip.

Examination of the larynx showed marked improvement.



February 6, 1920. Abscess of neck still draining and had had occasional chills and rise of temperature. Examination of larynx showed same to be absolutely normal, no evidence of any pathologic condition. Voice normal. Patient continued with chills and to grow weaker, but larynx was normal. Blood cultures showed no growth.

February 16. Right arm and hand became quite swollen, probably phlebitis.

February 17. Expired at 5:40 a. m. This case was a perichondritis with abscess formation. A secondary pyemia caused death.

From the history and clinical findings locally in the larynx, it would be very easy to make a diagnosis of malignancy, but microscopically and from the subsequent observation of the case, it proved to be nonmalignant.

CASE 2. Mr. F. G. Referred to us August 2, 1919, with the following letter:

"His trouble began in October of last year, with a persistent hoarseness. In December he reported to another physician for treatment. A Wassermann was taken and found to be four plus. Active medication of neosalvarsan intravenously and mercurial externally seemed to have no effect. I saw him July 14, 1920; hoarseness still persisted, pain on swallowing, considerable inspiratory dyspnea, loss of weight, temperature averaging 100, pulse 100. Wassermann, two plus; no lung disease. Larynx generally edematous especially over arytenoids and epiglottis. Marked redness of cords with ulceration of left, posteriorly. Cords did not approximate on account of a pea sized growth, cauliflower in appearance in the posterior commissure. Very active antiluetic medication with laryngeal injections of twenty-five per cent argyrol and a bland oil, caused marked improvement in the local appearance, and the patient was immediately more comfortable. Not satisfied with the continued symptoms, although improved, I sent a small specimen to the laboratory. (The report is here attached.) Microscopic examination of slide made from the sections of this tissue shows a presence of carcinoma."

On account of the difficulty in breathing and impending asphyxia it was necessary to do a tracheotomy. I might just mention, that immediately after the tracheotomy the tube slipped out of the trachea, and when I saw him a few minutes later there was a general emphysema of the entire neck. In this particular operation the tracheotomy wound was approximated very slightly, this no doubt being the cause of the emphysema. A few days

later another section of this growth was removed by us under suspension laryngoscopy. The microscopic examination of same proved to be a squamous celled carcinoma.

Examination at this time was made of the sputum and it was well as the stereo-x-ray examination of the chest confirmed the diagnosis of tuberculosis.

Seventy-five mlg. of radium were introduced into the larynx and left for eight hours. Following this treatment he complained greatly of a sort throat and upon examination (indirect), we found a great deal of sloughing from the radium, and the general condition of the larynx was more edematous than previously. On account of this severe reaction from the radium, he was sent back to his physician with instructions to push the antiluetic treatment as well as to institute general hygienic treatment for the tuberculosis. Also to return later for more radium treatment.

His attending oto-laryngologist deciding that on account of his tubercular condition he would get along better in a warmer and more equitable climate, sent him to Phoenix, Ariz. He improved somewhat in his general condition in the beginning, but later developed symptoms of exhaustion from which he succumbed in February, 1920.

In view of the fact that we did not see him again nor could we get any report from the oto-laryngologist who treated him in Phoenix, I cannot give any further report on the condition of his larynx.

CASE 3. Mr. F. S. Age 62 years. October 21, 1919, called with the following letter from his oto-laryngologist.

"I am sending Mr. F. S. who gives a history of hoarseness more or less for many months. At first he thought the condition was due to smoking and hence did not consult anyone. I saw him August 26, 1919, when an examination of his throat showed an exceedingly irritable pharynx with the left cord involved in a thickened granulating mass. The cord had some movement. A blood Wassermann was made which was negative. HWG test proved positive. Patient was given intravenously, six grains of cacodylat of sodium as provocative, and within twenty four hours both Wassermann and HWG tests were strongly positive. Since September 1, 1919, patient has been under antiluetic treatment. He has received two injections of salvarsan from his regular physician and has been receiving through me mercury and large doses of iodid of potassium, having taken ninety grains of the latter three times a day. Under this treatment the patient not

only failed to improve so far as the laryngeal condition is concerned, but there became a distinct involvement of the other cord and involvement of the left cord markedly increased. No piece was removed from cords for microscopic examination. It has seemed to me that possibly radium might be of assistance, so I am sending him to you."

Our examination shows the following:

No pain on swallowing; aphonia not complete; large dry healed ulcer on both sides of the septum; epiglottis negative. Bilateral thickening of vocal cords, left irregular edge, both red, motion normal. Approximation impossible owing to the irregularity and thickening. Entire larynx and trachea movable, not painful. Thyroid not palpable.

Left submaxillary gland large, movable and not painful. Smaller one on the right side.

Under suspension laryngoscopy specimen was removed. Wassermann two plus.

Microscopic report of piece removed showed a benign papilloma. No evidence of malignancy or tuberculosis.

October 28. Fifty milgrs. of radium was inserted and left for one hour. October 31. Fifty milgrs. of radium inserted and left for one hour.

For the next few days there was a marked reaction from the use of radium.

Kept under observation with local treatments to the larynx in the way of steam inhalations with benzoin and silvol. November 18, our records show a report of perfect action of cords, voice very good, condition so satisfactory that radium is not to be used. November 19, .09 of neosalvarsan given intravenously. For the next two months he was given antiluetic treatment and on December 13 left for his home. Examination at this time showed that his voice was very much clearer, cords paler and smoother, but still somewhat thick.

On May 22, 1920 he again came under our observation and we found the condition of the larynx as follows:

Laryngeal condition the same as when he last presented himself on December 13. Just previous to his visit to us he consulted two eminent laryngologists in the East, and they advised him to have nothing further done in the way of treatments to the larynx or the luetic condition. The reason for this advice is not quite clear to us, but he has decided to have nothing further done.

The next case I wish to report deals with my subject under

consideration, but the main reason for reporting same, is to warn oto-laryngologists from accepting a diagnosis from a general surgeon or internist without at least attempting to verify it. I have found that so many cases have been diagnosed and the diagnosis passed from one to another without any attempt being made to substantiate it.

Mr. H. C. R., age 22 years. Consulted me August 24, 1914, stating that he has had trouble for past two years. At present suffering from a markedly sore throat. Condition began with tubercular glands of the neck on both sides which were operated upon. A gland removed one year ago for diagnostic purposes. Has five brothers and sisters all in good health, as well as father and mother.

Two years previous felt weak, sleepy and had marked loss of vitality. He was told at that time to take up outdoor employment. Had lost much in weight. Normal weight 152 lbs., now weighs 120 lbs. Gland on right side removed in May, 1913, since which time it has been draining.

Present complaint. Sore throat and hoarseness which he has had for several weeks. No fever or night sweats. Expecterating a little bloody mucus. Throat very raw, almost impossible for him to swallow any food. Sputum and blood examined previously, which I was informed was negative. Upon examination of the throat a large ulcer is seen on the posterior pharyngeal wall extending from high up in the vault, down to the epiglottis. Irregular, deep ulceration extending to the common ligament of the cervical vertebrae. A very marked necrotic odor present. There is also an ulcer of similar nature on both vocal cords. Patient has been examined recently by four prominent Chicago physicians who pronounced this infection tubercular. Most probably on account of the report from the laboratory which he always carried with him, and which stated that the gland which had been removed a year previous was tubercular, none of the above mentioned physicians had made a serologic examination of the blood. When I questioned the patient regarding the statement in which he said the blood was normal, I was informed that someone had taken a drop of blood from his ear and told him it was all right.

Clinically it was a typical picture of syphilis, and a serologic examination of the blood by three different laboratories showed it to be four plus. At no time could I find any evidence of tuberculosis of his lungs, and the oft repeated sputum examination was always negative. I immediately placed him on antiluetic treatment of intravenous injections of salvarsan

and within a very short time he began to improve and rapidly gain weight and strength, and the ulcerations healed. The fistula in the neck continued to drain for a long time after the pharyngeal and laryngeal conditions were healed out. As the patient grew stronger and increased in weight, this fistula gradually became smaller, with less discharge therefrom. Condition finally healed by injections of bismuth paste. On January 20, 1915, the Wassermann was negative; patient was back to normal weight and felt fine. Repeated blood Wassermans and examination of the spinal fluid always proved negative. Shortly afterward the patient was married and now has two perfectly healthy children.

This case was no doubt a tuberculosis of the glands of the neck, which was proved microscopically to be so, but the pharyngeal and laryngeal ulceration was luetic. Simply verifying my contention that one should search for various conditions other than the primary diagnosis.

Case 5. The last one, and the most interesting of all, Mr. B. F., age 48 years.

Loss of voice; this condition came on two years ago, gradually growing worse. Pain present, especially on swallowing, for the last eight months. Patient attributes this to change of climate, he having lived in California for the past eight years. Was examined by a lung specialist, who stated that the chest was O. K. Was then treated by an oto-laryngologist in Cleveland a short time ago, who advised a laryngectomy as a diagnosis of malignancy had been made.

Examination. Fixation of arytenoid left side. Thickening subglottically; infiltration along the side of the larynx. Large glands. Pharynx anemic. Is able to produce sterterous breathing on deep inspiration.

On October 27, 1919, a tracheotomy was performed. Nothing unusual occurred. Blood negative as to Wassermann test.

On October 31, under suspension laryngoscopy, left cord and arytenoids were found fixed in a mass. Specimen taken for microscopic examination.

November 19. Gland on side of neck removed for microscopic examination. Both specimens of laryngeal tumor and gland were found to be old connective tissue with round cell infiltration.

December 4. Patient states he can do without tube. Laryngeal picture the same. Tube removed.

December 8. Tracheotomy wound healed, breathes well. Left hospital.

February 13, 1920. Returned on account of dyspnea, tracheotomy tube inserted. During all the time he has been under observation, we made repeated sputum examinations, and on two occasions found a very few tubercle bacilli. His laryngeal condition continued to grow worse, i. e., more and more obstruction. At same time, deglutition became more and more difficult, so that only fluids could be taken, and finally he refused to take anything. Continued under our observation and finally succumbed on September 30, 1920.

On October 1 a postmortem was made. Marked emaciation generally and noticable of intercostal depression. Tongue, floor of oral cavity, anterior wall of pharynx, larynx and trachea and esophagus removed for specimens. Tongue and epiglottis normal.

Larynx. Left arytenoid region contains yellowish green mass, smooth, hard and soft at different places. Right arytenoid normal; subglottic region contained cavity, size of marble, with evidence of ulcer, being filled with whitish soft mass. On section posteriorly, cricoid cartilage markedly thickened and thyroid converted in a mass as such. The cords contracted and not recognizable as such. Anterior thyroid region at base of epiglottis on section showed thick yellowish pus resembling a broken down gumma. Smears and cultures made from same. The aforesaid polypoid, transformed arytenoid was removed for microscopic section.

Section through rayed surface of arytenoid region also taken for examination.

Esophagus appears normal, except swelling posteriorly encroaches upon it.

Lungs. Both pleural cavities contained some free fluid, noninflammatory. No adhesions. General anthracosis. No consolidation. Lower left lobe contains palpable masses. This and right upper tip saved for specimen.

Heart. Normal size. No pericardial fluid. Heart wall on section normal. Specimen saved. Aorta mediastinal glands small.

Abdomen. No free fluid. No adhesions. Only slight amount of distention. No masses.

Liver. No tubercles. Normal spleen. Kidneys negative. No mesenteric enlargement.

Microscopic section shows absence of any suggestion of lues, tuberculosis or malignancy. Mucous membrane is unbroken and not much thickened. At other places appears to be a papillary formation that does not fit into the category of papilloma.\*

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\*On account of the shortness of time am unable to give the exact findings of the sections, but these will appear later when paper is published.

## FREQUENCY OF TRACHEAL TUMORS—WITH A REPORT OF A CASE OF MALIGNANT STRUMA IN THE TRACHEA

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The rarity of tracheal tumors and their interesting clinical history and pathology give them an importance worthy of careful study. In the study of this subject much credit should be given to the earlier clinicians. They had not the means for diagnosis which is at our disposal today. The laryngeal mirror was the only means the earlier investigators had for exploring the larynx and trachea. In the use of the mirror, however, they possessed a remarkable skill. Schrötter stated that he had seen the bifurcation of the trachea 70 times. Morel Mackenzie was able to see it in 12 per cent of his first hundred attempts; 21 per cent of his second hundred, while in his last hundred attempts he saw it 40 times. It is of passing interest, that during the period in which Mackenzie diagnosed 220 laryngeal tumors he saw but 4 tumors of the trachea, his ratio being therefore 55 of the former to one of the latter. Castex claimed to have seen the bifurcation in 3 out of 7 cases examined.

The diagnosis of tracheal tumors is often not easy, the vague symptoms so frequently associated with these tumors not pointing to obstruction. Usually the early symptoms comprise mild asthmatic attacks or a persistent cough, which are often considered due to other causes. Even tumors of good size may not give rise to obstructive symptoms but merely to difficulty in phonation, and if therefore the larynx be found intact, the trachea may not be suspected as the seat of trouble. Often careful examination may fail to disclose the tumor, and it may be only after persistent and repeated attempts that a growth may be demonstrated.

There are a number of valuable contributions dealing with tracheal tumors. Those of von Brunn, Lemoine and Krieg of the older writers have established a basis for future contribution upon this subject.



Tracheal tumors reported in literature must be divided into benign, malignant and doubtful growths, the latter being the ones in which no definite pathologic diagnosis is given.

Under the inspiration of Prof. Castex, Lemoine presented a thesis in 1900 entitled "Etude sur les tumeurs de la trachea." The author, using as a nucleus the 57 cases originally assembled by Solis-Cohen, collected notes of 99 cases. Of this number 63 were benign and 36 malignant, 8 of the latter being examples of sarcoma. The diagnosis was established by the laryngoscope in 34 instances, in 48 by autopsy and in 4 by tracheotomy. In the remaining 13 cases the method of diagnosis does not appear. The benign tumors of Lemoine's report are conveniently divided into polypi and pseudopolypi. Although the majority of his benign tracheal tumors are polyps, their pathology was varied, the fibromata and papillomata predominating. The number specifically mentioned as papilloma was 11, while of fibromata there were 12. Three are designated simply as "polyps." One is termed a "keloid" with a query after it. There is but one case each of myxoma and lipoma, and one also of adenoma. There were 7 osteomas and 3 enchondromas showing that next to fibroid and papillomatous growths, hard bony or cartilaginous tumors are most common. There is one instance of benign lymphadenoma, and of the remaining tumors no diagnosis was made. Lemoine gives the clinical history of only 66 cases, and no special plan or order is followed. Presumably in the others the data were insufficient to be of value. This constitutes a summary of Lemoine's work on tracheal tumors collected up to the year 1900.

In 1898, von Brunn compiled 143 cases of tracheal tumors in an article on this subject. Lemoine, however, apparently had no knowledge of this work when he prepared his thesis in 1900.

Ten years later, in 1908, Krieg, von Brunn's assistant, brought out a further study on the subject. Krieg brought the reports up to date and collected a total of 201 cases, which was nearly twice the number collected by Lemoine in 1900. He gives a summary of 58 cases collected in the 10 years interval subsequent to the appearance of von Brunn's paper. This would mean a report of about 6 cases a year which may be taken as a fair average. Thus there should have been some 72 cases placed on record between 1908-1920, although doubtless the five years of warfare kept the number reported much lower. Krieg's table showing

the diagnosis in 201 cases of primary tracheal tumor is as follows:

Benign Growths	
Fibroma .....	25
Papilloma .....	41
Lipoma .....	4
Chondroma and Osteoma.....	42
Adenoma .....	6
Lymphoma .....	2
Intratracheal Thyroid .....	14
Malignant	
Sarcoma .....	21
Carcinoma .....	40
Doubtful	
.....	6

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Total ..... 201 up to 1908

#### *Carcinoma of Trachea*

To 31 cases of carcinoma of the trachea collected by von Brunn up to 1898, Krieg adds 9 others reported during the following decade, thus bringing the total to 40. Krieg makes no attempt at a complete analysis save in the 9 recent cases. Six of these were in males, the youngest patient being 41 and the oldest 68. The symptoms were vague, consisting of dyspnea, cough, hemoptysis and hoarseness. In 4 cases the tumor was in the upper trachea, in 5 toward the bifurcation. Only 2 cases of the 9 were submitted to operation. One was an emergency attempt to relieve dyspnea and the other a successful resection of the trachea, in which patient was well and free from recurrence  $4\frac{1}{2}$  years later. All the cancers of his series found in the region of the bifurcation, he regarded of embryonic origin, while the cancers high in the trachea he considered to resemble cancer of the larynx.

In 1909 Schmiegelow published an article on primary carcinoma of the trachea. This author evidently made a thorough study of the literature at first hand. He takes the original 31 cases of tracheal carcinoma of von Brunn published in 1898 and corrects it to 28, by eliminating 4 instances of carcinoma involving larynx as well as trachea. Twelve more he found in old and recent literature, being cases reported by Louis (1862), Delafield (1882), Ohloff, Billroth, Vitrac (1896), Koschier (2) 1896-1898, Boschi (1899), Heinzmann, Hoffman (1905), Theisen (1906), and Schmiegelow (1909). This brings to the year 1909 the total of primary carcinoma of trachea to 40.

Ingersoll in 1914 cites 5 cases which were published after Theisen's complete resume of the subject in 1906. These 5 cases were reported by Nager, Eidesheim, Berens, Simmel and Kaunitz, and it brings the number of carcinoma to 45. To this number should be added two by Schrötter which are found in Krieg's collection and the case of Birscher of cancer in a struma, which increases the total to 48 up to the year 1914. Subsequent to 1914 we have been able to find but 2 other reported cases.

### *Sarcoma of the Trachea*

Sarcoma of the trachea is rare, as von Brunn could but find 14 cases up to 1898. Krieg added 7 in the decade which followed or less than one a year. In 1916 Berggren published a paper on sarcoma of the trachea in which he corrects von Brunn's report by rejecting 3 cases because of their involving the larynx and trachea jointly. This makes a total of 18 cases which corroborates Theisen's figures. Berggren mentioned 2 subsequent cases together with one of his own thus bringing the final total to 21. The diagnosis was in all cases made with the microscope and examples of round cell, spindle cell, cylindroma and myxosarcoma were seen. The essentially benign character of some sarcomatous tumors is shown by the high percentage of cures by surgery. Of the 7 cases of Krieg, one was free from recurrence 4 years after operation, another 1 year and a third after 10 months. In 5 cases the operation was tracheofissure in 2, and electric snare by natural passages in 3. The various tumors were described as being the size of a hazel nut, almond, cherry, half a small chestnut, the "thickness of a finger" and  $2\frac{1}{2}$  cm. long. In 4 cases the notes are scanty. Analysis shows that the sexes are affected in about the same proportion. The age is stated in only 14 cases, 4 being in the second decade of life, 3 in the third, 2 in the fourth, 4 in the fifth and 1 in the sixth. The youngest patient was 11 years and the oldest 78. In 19 cases in which the location was given, the area most frequently involved is the upper posterior portion of the trachea. Two cases are given in which the tumors were found close to the bifurcation. Only one case, that of Chiari-Maydl, was multiple. In 11 out of 18 cases the diagnosis was fibro—or spindle cell sarcoma. The most malignant seem to have been of the round cell type. In 17 cases an operation was performed. The immediate result was good in 13.

### *Intratracheal Struma*

von Brunn found notes of 7 cases of intratracheal thyroid

tumors up to 1898, and Krieg found 7 others in the next 10 years, making the total 14. In the latter series of 7 a histologic examination corroborated the diagnosis in 5. One had undergone sarcomatous degeneration, and in the 7th the report is silent on a microscopic examination. Of the 14 cases only 4 occurred in males. The majority of the patients lived in goiter countries. In 5 of the last 7 cases there was a visible goiter. All patients presented dyspnea, which was progressive. In these 7 cases laryngotracheotomy was performed in 4, and in 1 the tumor was removed by natural passages.

As to the origin of these strumas there is no definite agreement. Some adopt the misplaced embryonal theory advocated by Brunn while others are convinced that the intratracheal tumor is an invasion of the trachea by the lateral lobe of the thyroid, as has been suggested by Paltauf. The discovery of mucous glands in the thyroid tissue of one tumor is believed, however, to discredit Paltauf's theory. Lemoine cited cases of goiter in which the thyroid tissue appeared to have forced its way through the tracheal wall. Krieg does not even allude to such a mode of origin.

In addition to the 14 cases of intratracheal struma there are on record three cases with mirror diagnosis only. Neumeyer reported 2 in 1903 and Franckenberger one in 1904. Their diagnosis was based on presence of goiter, the symptoms and naked eye appearances. In the absence of a microscopic or pathologic report the cases were rejected. Franckenberg's patient died of a dyspneic crisis without autopsy.

#### *Primary Cancer of the Trachea in an Intratracheal Struma.*

Reports of these interesting tumors were collected by Birscher in 1908, about the time that Krieg published his paper on tracheal tumors. He discusses the subject briefly and enumerates 18 cases including his own. Lombard and Baldenweck, 1914, found 4 more cases which brings the total up to 22, and my own case herein reported makes 23 on record in 1920. Birscher gives scant data in his report. He states, however, that the majority of these tumors were seated on the posterior wall of the trachea. His own case is rather remarkable because it occurred in a subject far gone in tuberculosis, with laryngeal tubercles and a permanent tracheotomy fistula (operative). This woman, aged 56, lived in a goitrous neighborhood. When she came to the clinic she was in the condition stated above. Inspection of the trachea through the wound showed tracheal tumors. A biopsy test of a

portion of the growth showed a thyroid cancer corresponding exactly to cancer of the thyroid gland. My own case occurred in a man the history of which follows:

Name: Mr. X.

Complaint: Difficult breathing, as though something were obstructing the air passages.

Family History: Father dead—Injury. Age (?). Mother dead—Operation. Age (?). 2 brothers alive and well; 1 sister, 23 yrs. "Bright's disease." Wife, 2 sons, 2 daughters alive and well. 1 daughter died in infancy. No history of tuberculosis, cancer.

Past Illness: Diphtheria when a child. No other illness.

Habits: Sleeps poorly; appetite poor; bowels regular; smokes and chews tobacco, drinks beer occasionally, denies drugs.

Present Illness: Ten years ago (1910) noticed tickling in throat causing him to cough. Three years ago (1917) developed asthma which became progressively worse. Patient noticed a difficulty in breathing as though something were obstructing the passages of air in the throat. Coughed to relieve this feeling, and after much coughing would at times spit up blood. This condition has persisted with no relief, except the temporary benefit obtained from medicine given hypodermically. For the last three weeks the dyspnea grew worse, and on January 16th dyspnea became so pronounced that he was hastily removed to the hospital by ambulance. On arriving at the hospital was having marked distress and a rapid tracheotomy was done under local anesthesia. On opening the trachea a part of the tumor could be seen at the 4th ring on posterior wall and a little to the left. A portion was removed for examination. A cannula was inserted and patient sent back to bed. The third day following, the trachea was divided down to the fourth ring and what remained of the tumor was removed under local anesthesia. The base was cauterized and trachea closed. Uneventful recovery.

#### *Physical Examination after Operation.*

Eyes, normal. Ears, normal. Nose, normal. Throat, normal. Tracheal obstruction. No enlarged thyroid. Chest, fair expansion. No other abnormalities except chronic bronchitis. Heart, no murmurs. Sounds not of proper muscular quality. Apex 1st and 2nd sounds about equal. Liver, normal size. Abdomen, negative. Pulse, rapid, wiry, slightly arterial sclerotic. Certain amount of anemia. General appearance good. Extremity, right leg amputated below knee.

Diagnosis: Obstruction in Trachea. Neoplasm. Malignant(?).

*Pathology.*

Report of Dr. Burton T. Simpson, pathologist of the State Institute for the Study of Malignant Disease.

"We have on file three series of sections from material which was prepared by Dr. Williams. Microscopic examination of section made from this material showed the same to be made up of tissue of an adenomatous character, similar to that found in adenomata of the thyroid gland, characterized by alveoli, lined with low cuboidal epithelium, showing rather solid nuclei. Many of the lumina of these alveoli contain material which resembles colloid material, as found in the thyroid gland. One would interpret from these findings that the tumor apparently sprang from the wall of the trachea. The second piece of tissue removed was from the outside of the tracheal wall. Microscopic examination of the same showed it to be made up mostly of granulation tissue. The other material obtained later showed the picture somewhat similar to the material first obtained, except that the alveoli were much more irregular, and there was apparently an attempt at tubular formation. The character of the individual cells was also altered, they being more irregular, and the nuclei were more of a vesicular type, and frequently showed mitotic figures. Occasionally one would find in the lumina of these alveoli, material resembling colloid. While a casual glance might give one the impression of adenocarcinoma, still in view of the portion of the tumor first obtained, and the general resemblance to the second piece of tumor one is led to a diagnosis of malignant struma."

The following are the reporters and the year of the reports. Ziemssen, 1875; von Brunn (4) 1878; Heise, 1888; Roth, 1888; Rade-stock, 1888; Paltauf, 1892; Baurowicz, 1898; Franckenberger, 1904; Bircher, 1908; Lombard and Baldenweck (4) 1914; which includes the cases reported by Hoffman, Brentano and Kauffmann, making 22 and my own case brings total to 23 up to 1920.

*Osteomata and Chondromata of the Trachea*

Lemoine made but brief mention of these growths but von Brunn and Krieg supply the omissions. von Brunn cites 29 cases to which Krieg adds 13, making 42 in all. For many years these growths were seldom recognized clinically and were erroneously

believed to cause slight or no symptoms. Of the 13 cases collected by Krieg, 4 were correctly diagnosed during life.

These tumors may give rise to varying symptoms—sensory, pressure, obstructive, as well as causing an ozena of the trachea. The sex incidence is equal. Since bone and cartilage appear to be present in all tumors investigated, the name osteochondroma is doubtless most appropriate. These growths contain an abundance of elastic fibers. They are best considered to be ecchondroses, growing from the perichondrium of the tracheal cartilages. Some are found isolated, however, having probably developed by metaplasia. These growths have a strong tendency to be multiple, which explains why they have been confounded with papillomata.

#### *Fibroma of the Trachea*

The original collection of von Brunn's comprised 23 cases of fibroma, and to this number Krieg was able to add but 2 more up to 1908, one in the practice of von Brunn reported in this connection and the other by Elsberg in 1906. The age of Elsberg's patient was under 13. Krieg makes no attempt to analyze the 25 cases beyond the general statement that they are solitary, sometimes pedunculated and sometimes sessile, from pea to a hazel nut in size or even larger. Fibroid polyps are most commonly found in the upper third of the trachea. The tumors of von Brunn and Elsberg were both large, the size of a cherry, almost occluding the lumen of the trachea. They were, however, readily removed by tracheotomy.

Fibromata compared with papillomata show pronounced differences. Fibromata are solitary, papillomata usually multiple. Papillomata may be often associated with or preceded by laryngeal growths of the same kind. Fibroma are not commonly seen in children while papillomata are frequent. Papillomata show tendency to recurrence; not so fibromata.

#### *Papilloma of the Trachea*

Up to 1898 von Brunn found notes of 33 cases and Krieg was able to add 8 others. Krieg made no attempt to analyze these 41 cases. There is no mention of posttracheotomy growths in the wound or scar.

#### *Malignant Growths not Classified as Cancer or Sarcoma*

*Endothelioma of the Trachea.* Goodman published in 1915, a case of endothelioma of the trachea and as far as he can learn

but two cases have ever been placed on record. These were reported respectively by Heymann and Henrici. Goodman's case was of unusual interest. His patient was 21, male, seen in April, 1915. When 14 he had been tracheotomized for diphtheria. When 18 he began to suffer with dyspnea and consulted Freudenthal. A mass could be seen below the glottis, a diaphragmlike formation, crescentic with concavity forward. The tumor was removed by tracheotomy. Two years later dyspnea returned and a reddish mass was seen in the mirror in the original locality. The growth was again removed by tracheotomy and radium used, but there was rapid recurrence. Goodman did not see the patient until 1915, after the second recurrence, when the trachea was again exposed and a soft sessile mass was removed from the right wall, one ring below the cricoid cartilage. Dr. Fraser declared the growth an endothelioma. Three years later Freudenthal saw the patient, now 27 years old, and he appeared in good health. His dyspnea recurred, and wishing for a radical cure an attempt was made to dilate a contraction consisting of two bands below the vocal cords, resembling a second glottis. This failing, a tracheotomy was performed, resulting in death from hemorrhage. Freudenthal considered this a "Recurrent Teratomatous Growth of the Trachea."

#### *Miscellaneous Tumors of the Trachea*

*Lipomata.* There are but 4 of these on record and of these only one reported by Hunt in 1907 was a pure lipoma.

*Adenomata.* There were 5 cases in the older series and Krieg adds one, making 6. The one included by Krieg was reported by Rosenheim in 1914 and was technically a colloid fibroadenoma. These growths may have had a thyroid origin associated with the enlargement of the thyroid during pregnancy. One reported by Theisen occurred in a gravid woman also. In a case reported in 1880 by Radestock, the original diagnosis of struma intratrachealis was later changed to adenoma. It is possible that these adenomata stand in some relationship with the strumas.

*Unclassified.* Krieg gives 6 tumors without diagnosis. The obscurity is due in part to incomplete data. Reported by Schutter, Farlow, Bellissen, Daland, and Prota.

In 1914 Lombard and Baldenweck endeavored to add to Krieg's table of intratracheal tumors all cases reported from 1910, as follows:



## Benign Growths—

Krieg's Table .....	201
Fibroma .....	4
Papilloma .....	10
Lipoma .....	10
Chondroma and Osteoma.....	5
Adenoma .....	0
Lymphoma .....	0
Angioma .....	1
Amyloid Tumor .....	1
Intratracheal Thyroid .....	5
Malignant—	
Sarcoma .....	2
Carcinoma .....	16
Doubtful . . . . .	5

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Total to 1914..... 251

To this may be added the reports of intratracheal carcinoma of Litwinowicz 1910, Tetans Hald 1912, a papillary granuloma reported by Herbert Tilly 1920, and my own intratracheal struma, making a possible total reported to 1920 of 255 in all.

It must be borne in mind that intratracheal tumors are rare and may be easily overlooked. Any persistent disturbance of respiration with increasing dyspnea should prompt a most persistent and painstaking examination. To-day the tracheoscope and bronchoscope will render possible a diagnosis which might be impossible without their aid. The surgical treatment of tracheal tumors is very favorable and many cures have been reported by the resection of the trachea. The future may show X-ray or radium to be of great value, but surgery when possible should be employed.

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## DISCUSSION

DR. THOMAS E. CARMODY, Denver Colo.: These cases of Dr. Pollock's are, of course, all atypical cases, and they are the hard ones to diagnose. If we always had typical text-book cases there would be no question about making a diagnosis, in many of them at least, but in cases that do not resemble what we expect we will always get into trouble. In encountering a mixed condition in Colorado, we always expect to find tuberculosis, and we sometimes do. However, some cases are sent to Colorado for syphilis, but not nearly as many as we found a few years ago. There are quite a number of cases of tuberculosis and syphilis combined, and I have seen two cases of tuberculosis and carcinoma combined. I have never seen but one case of sarcoma and tuberculosis, and that one was seen with a colleague. The cases of tuberculosis are easily diagnosed, if they are pure tuberculosis, by the methods Dr. Pollock has described, and usually there is not very much question. If the patient has tubercle bacilli in the sputum it is very easy to make a diagnosis of tuberculosis, but we may also find syphilis in these cases, especially where there is a great deal of scar tissue. Tuberculosis does not produce scar tissue, as a rule.

The results of laboratory examination we must take with a grain of salt, and much depends upon who makes the examination. I think the laryngologist should see the slides himself in all the cases because he can frequently make a diagnosis when the pathologist falls down. Then, as in one of Dr. Pollock's cases, we may be able to clear up one condition and in clearing it, clear up the other also by increasing the patient's resistance. I heard a practitioner say that he was glad to see a case of tuberculosis and syphilis in Colorado, because he could cure the syphilis and then the tuberculosis would be more likely to clear up. If we increase the vitality the tissue immunity will take care of itself. When we find the larynx and palate anemic, the case is in the late and practically hopeless stage of tuberculosis. The marked hyperemia we find in syphilis alone, but in the mixture of tuberculosis and syphilis we may have some trouble in making that diagnosis.

Another thing I have fallen down very frequently on—I don't know whether others do or not—is in not getting a complete history, especially in the case of doctors and friends. I fell down very hard and Dr. Joseph Beck found me out not long ago, in the case of a doctor. The doctor gave no history of syphilitic infection when I saw him, but Dr. Beck examined and questioned the patient

and obtained the syphilitic history. I have had that happen much too often. The blood picture Dr. Pollock has spoken of, and we must give a provocative treatment before the Wassermann test.

We must be careful in giving potassium iodid in cases with pulmonary tuberculosis, because that frequently causes a too rapid breaking down of the lung tissue.

DR. GEORGE F. COTT, Buffalo, N. Y.: I wish to say that the paper of Dr. Wurtz is a distinct and valuable contribution to the literature of intratracheal tumors. I do not suppose that every one of us has seen cases of this kind. I have seen two cases, the one of Dr. Wurtz's and another in my own experience. The patient was brought to the hospital very weak and could not lie down because when he did, breathing stopped. We set him up on the operating table and I did a tracheotomy without any anesthetic, introduced a tube but he did not breathe any better. Then we put in a soft rubber catheter and he immediately breathed easier. After two or three days he was able to be up and dressed and I made an examination. I could see a distinct tumor, which appeared to be at the bifurcation, and which seemed to fill the entire trachea. It was distinctly round and of a yellowish-white appearance. The patient was improving very rapidly and feeling good when on the seventh day he suddenly died. Postmortem was not permitted.

What interested me much were the thyroid tumors in the trachea. I know we get them in the upper part of the throat and tongue but not often in the trachea. In the twenty-three cases mentioned by Dr. Wurtz, it puzzled me how they got there.

I spoke to Dr. Simpson of the New York State Cancer Laboratory about it and he made the statement, that in the formation of the embryo the embryonic cells have the ability of forming thyroid tissue, and such cells may form benign or malignant tumors. Second, it is well known that a small myoma may give off cells through the circulation which may settle in any part of the body and produce tumors. Examination of the thyroid gland in some of the cases shows small adenomata, which are benign. Third, it is conceivable that these adenomata may be found anywhere in the cervical region, and may infiltrate the wall of the trachea and produce a tumor in that location. I think them very interesting and rather important.

Regarding the examination by Dr. Wurtz, if Dr. Jackson had been there they probably could have taken it out with the bronchoscope. Dr. Jackson said he was not expert enough with the indirect method and so took up the direct. The late Dr. Curtis said he was fairly expert with the indirect and so did not take up the direct. We, the common people, take up the easiest way and find by the tracheotomy route sometimes more than by the straight method. Looking through the bronchoscopic tube, being a considerable distance, the length of the tube, away from the growth, one forms a different opinion than by a close up view. Since we have the St. Clair Thompson method it is almost a pleasure to have the operation done. I have often had patients get up after operation and thank me because they had no pain.

Sir St. Clair Thompson's method consists of: first, infiltrate the

skin with a local anesthetic, then dissect down to the trachea and inject  $2\frac{1}{2}$  per cent cocain, 15 drops, into the trachea, wait 10 minutes then open trachea without struggle, cough, or any other symptoms. For this reason he calls the operation "Tranquil Tracheotomy."

DR. WILLIAM MULLIN, Colorado Springs, Colo.: I consider Dr. Pollock's paper very instructive. I am glad that Dr. Carmody corrected the statement of his fellow practioner, "that if he could cure syphilis the tuberculosis patient would go on and get well." These cases are dangerous because treatment of the syphilitic condition is liable to do the tuberculous patient harm. I find it an enormous bugbear in my practice, where these two conditions are found in the same patient, to decide which treatment should predominate, and when to stop pushing the treatment. Time and time again the internist will tell me that the trouble in the chest is lighting up in a very dangerous way. This means a very close relationship between the internist and the laryngologist. If you just accept a report that comes by mail as to the condition of a patient or of a specific test you will be misled. You have to work with a man whose work you know, so you will understand just what he means when he tells you that such a condition is present in the chest, likewise he must understand you.

In a recent article in the Laryngoscope, one man said he had diagnosed thirteen out of fifteen cases of syphilis by laryngeal examination alone. Such a statement seems absurd.

Another thing is that examination of the chest after tracheotomy is of no value. The chest sounds are changed so that the internist can make nothing out at all.

One point that may be of some value regarding differential diagnosis in tuberculosis—the infiltration in tuberculosis starts in the deeper tissues and comes to the surface; very soon it makes pressure on the blood vessels which lie close to the cartilage underneath. This prevents a venous return, and you have a throwing out of a serous exudate from the stimulation and oversecretion of the glands. This produces an edema beneath the mucous membrane, and gives a shiny appearance which isn't often seen in syphilis and malignancy.

I should like to emphasize the value of a double Wassermann test in all of these cases. Dr. Pollock said he had a stereoscopic roentgenogram of the larynx in all these cases, and I think that is of the very greatest value. Especially will it show tuberculous densities, and they will show in the stereoscope long before they can be detected with the laryngeal mirror. In regard to the case spoken of with the tuberculosis glands of the neck but not a tuberculous larynx, it is possible that the glands of the neck might drain into the larynx but it is not likely, as they usually drain into the peribronchial group.

DR. R. C. LYNCH, New Orleans, La.: It seems to me one of the great points Dr. Pollock wanted to bring out was the fact that when he made a diagnosis clinically of one condition, it did not necessarily follow that that was the only thing that could take place

in that lesion, and no matter what the clinical phenomena that were exhibited at the time of examination, that patient should be put through the same examination for other states that might obtain at the same time.

One of my experiences was with a woman who took a small cup of black coffee, as French people are apt to do, and drinking the coffee rather rapidly she choked on something and had a slight hemorrhage from the throat. She seemed to get along fairly well for two or three months and then she fell into the hands of a laryngologist who made a diagnosis of a recurrent paralysis of the larynx. I saw her a month afterward and removed a screw from beneath the vocal cord. Six months later I saw the patient again because of the recurrence of the paralysis, and on removing tissue from the area found it to be carcinomatous—one of the cases of trauma on which was engrafted carcinoma.

Another case was that of a man who was in service in Massachusetts in the quatermaster's department and spent his time at a wharf controlling men who were loading ships. He used his voice in various temperatures and developed what was supposed to be a perichondritis. He had pus from both perichondrial surfaces of the thyroid and was discharged from service. I saw him about four months later and he died about a month ago from carcinoma of the larynx.

It seemed to me the particular thing to be brought out in this paper was, that where carcinoma was diagnosed, tuberculosis and syphilis should be excluded. When tuberculosis and syphilis are diagnosed alone, the other two should be excluded before deciding what is best to be done for the patient.

DR. GEORGE W. BOOT, Chicago: I have not much to say except that this is a rather serious subject and should not be treated lightly. This question of differential diagnosis comes up in the examination. I once had a patient of about thirty-five who gave the history of syphilis, with a positive Wassermann reaction. He developed pulmonary tuberculosis, with tubercle bacilli in the sputum, and finally died. At the postmortem we found syphilis, tuberculosis and carcinoma of the larynx.

With regard to the other paper on tumors of the trachea, I am going to steal a march on Dr. Beck and mention a case I saw at the County Hospital. The patient was a man with a tumor about the size of a small marble. Dr. Beck allowed me to assist him in the operation and under suspension we removed a tumor of the larynx which was secondary to carcinoma of the thyroid.

DR. JOSEPH C. BECK, Chicago: I wish Dr. Boot could have told you his experience in citing multiple affections of the larynx in a recent civil service examination. It would have been amusing, but not scientific. Sometimes examiners on such occasions are prejudiced by remarks made in paper. I will not discuss Dr. Pollock's paper because it is based on material which is in our conjoined practice. I wish he had had more time to develop the last case, particularly the histologic pathology. It will become a very interesting report when we get in all the results. Dr. Boot made a diagnosis of rhinoscleroma on this man, and he must have had good reasons for

saying so at the time of his examination. Dr. Chamberlain and Dr. Crile diagnosed carcinoma and were going to take out his larynx and surely they must have had reasons. An assistant of ours saw the tubercle bacilli on two occasions and one would take that as some evidence of value. The Wassermann reaction was positive and became negative after antiluetic treatment. Yet the complete findings of the postmortem examination do not fit into a category with anything I have ever seen. Microscopically the section has a normal mucous membrane over the papillary excrescence, a sort of a wart.

In regard to the tracheal tumors, we, Pollock and myself, had a case of sarcoma and I reported it. I have since reported another malignant tumor of the trachea (carcinoma). I am sure these two reports were made by myself. In the future when some gentleman is reporting, will he please remember that men are doing something along these lines in this country also. In this paper I heard nothing but reports of Edelheimer, Stein and Zwibach.

DR. E. P. HALL, Kansas City, Mo.: This discussion made me anxious to report a case I had at the University of Kansas. The man came on account of difficult breathing; suspension laryngoscopy showed a subglottic growth. I did not get enough tissue because he took the anesthetic very badly, and the pathologist could not make a report from the tissue submitted to him. A tentative diagnosis of carcinoma of the larynx was made and a preliminary tracheotomy proposed, that the patient might go home to attend to business affairs. The tracheotomy was performed but the man died that evening, six or seven hours after the operation.

Autopsy: The larynx was removed and there was a fistula extending along the left thyroid cartilage from the junction in front to the posterior aspect of the cartilage. The report of the pathologist was a tubercular ulceration in the fistula. He made a diagnosis of sarcoma of the cricoid with a question mark. With that report I had to take into consideration the history that I obtained from the man's relatives after death; that he was working in the wheat field last fall and had a choking spell and claimed he had something down his throat. The beginning of his trouble dated from that time. Examination of the lungs was negative for tuberculosis, but he had enlarged glands (tuberculous) of the neck.

Conclusion: Traumatic ulceration with tuberculous implantation.

DR. HARRY L. POLLOCK, Chicago, (closing discussion): I wish to thank the gentlemen for their liberal discussion. I have not much to add, except that the subject is too large to go into in detail on every point, and I will simply say that as far as the sections themselves are concerned, we do not depend upon the pathologist but make our own interpretations. If we are at a loss we sometimes call in the pathologist to assist us. It is the same way with the internist—you have to know who the internist is. One of the cases I cited was simply to warn laryngologists from accepting so-called "handed-down" diagnoses. We do not accept any diagnoses without verifying them, and the same thing is true of the roentgenograms. We do all our own interpreting and do not depend upon any radiologist for making

a diagnosis, because 90 per cent of the time they are in error. A man who studies the specimens and pictures and studies the case clinically is far better able to make a diagnosis than the man who does not see the patient.

The edema has been called to our attention by Dworetzky who wrote a very nice paper. I did not go into the matter extensively as Dr. McMurray, of Pittsburgh, stated last year that diagnosis by X-ray preceded the clinical findings. He found many cases which proved upon autopsy to be tubercular long before the clinical picture showed it.

Of course we all know that we have had many cases of carcinoma following trauma. I remember one case distinctly where a man got a toothpick wedged in his larynx. It bothered him for some time and shortly afterward he presented himself at our clinic with a granuloma, and a few months afterward returned with what proved to be a squamous cell carcinoma.

The main point is not to be satisfied with your first diagnosis. Exclude all the things before you arrive at a definite conclusion. In cases of syphilis and tuberculosis the physician must use his own judgment as to which condition to treat. In treating syphilis in a patient with tuberculosis we have to be very careful because while we are curing the patient of syphilis he dies of tuberculosis in many instances.

DR. WALTER J. M. WURTZ, Buffalo, N. Y., (closing discussion): In my paper the principle purpose was just the primary tumors and not the secondary involvement. I had to use the tables and in those the American reporters are included, but as the time was so limited I had to stick to the foreign authorities. I thank you.



## PRIMARY SARCOMA OF THE MIDDLE EAR

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OMAHA, NEB.

Literature: It is difficult to properly limit the discussion of the literature on this subject for two reasons.

First, cases, especially the older cases, have been reported of clinical malignancy of the middle ear in which the diagnosis of sarcoma was never proven by section. In this discussion some cases will be included whose clinical history makes sarcoma more likely than carcinoma, and whose authors call them sarcoma. Of the 41 cases of sarcoma reported, sections were made in thirty, in eleven none were made.

Second, the primary seat of such tumors is often hard to determine, as even when autopsy has been done, the destruction has always been so extensive that the origin of the tumor could only be guessed at. Of the 41 cases reported, in twenty-four the tumor was primary in the tympanic cavity as nearly as could be ascertained, in seven the origin was in the petrous or mastoid portion; one, in the internal auditory meatus; one, in the dura near the petrous portion; one, in the internal meatus near the tympanum; one, in the Eustachian tube; and, in six, the origin was very questionable. In some of these last the accounts given are very brief. In all, however, there was more or less involvement of the middle ear, with destruction of part of the temporal bone. Of all the cases reported, where a diagnosis of sarcoma by section was made, seventeen were probably primary in the middle ear.

As to the types of sarcoma, ten were spindle celled or fibrosarcoma, five round celled, four myxosarcoma, one angiosarcoma, one telangiectatic, two mixed spindle and round celled sarcoma, two osteosarcoma, one squamous endothelial celled sarcoma, one giant celled, one fibromyxosarcoma cavernosum, and two were called simply sarcoma.

Clinically, the cases seem to fall into two distinct groups. First, the rapid growing, very malignant growths, occurring in children, always fatal, which run their course in from a few weeks to a year. This is quite a different picture from the slow growing type, occurring in persons past middle age.

In this group of 41 cases, twenty-one occurred in persons

below the age of twenty, eleven were in those of forty or over. Only five occurred between the ages of twenty and forty, while in the accounts of three no age was given, and in one only the statement that the patient was an adult.

The most rapid courses attended those below the age of sixteen, which included fourteen cases. Only two of these cases lived as long as eighteen months after onset, several dying in from four to six weeks, the average duration being six months. One inoperable case was still living when reported, but was first seen not long before the report was made.

In this class of cases it was noticed especially that the growths seemed to increase very rapidly after operative removal was attempted. It is in this class that most of the large bleeding tumors occurred. In the class of cases appearing after the age of forty, the course was often slower, two cases living five and six years respectively, and operation seemed to retard the progress of the disease. Of the cases of probable cure one was forty-three; one, thirty-nine, and one, eighteen years of age.

The clinical pictures were variable, but some symptoms occurred often enough to make it seem worth while to note their frequency.

Deafness of varying degrees was almost universal. Twenty-seven complained of pain at some time, and in many this was very severe and the predominating symptom. In twenty-six polypi or some external growth presented in the canal, and in a large percentage of these cases these polypi were removed by snare or curet one or more times before their recurrence suggested malignant growth. Ten cases had hemorrhage from the ear at some time, seventeen had facial paralysis, and this was often an early symptom, especially when the middle ear was extensively involved. Twenty had discharge from the ear at some time, and in most of them this had existed for many years before any symptoms of sarcoma were observed, which opens the question as to whether or not the irritative discharge itself did not suffice, in many cases, to set up the changes preceding malignancy.

This is the only hint of etiology given in any case except a few of the juvenile cases, where symptoms dated from traumatism.

Treatment was in nearly all cases only operative.

The radical operation was done in twelve cases. Simple removal of polypi, one or more times, in ten cases. In only

one case was a radical operation followed by X ray treatment, but this was without much effect in delaying the fatal outcome.

The results of cases are as follows: Death in thirty-three cases, inoperable. Condition poor, but living at time of report, three cases. (Milligan I, Ault, Wilde, III.) Recurrence after operation, but still living at time of the report, two cases. (Milligan II, Robertson.)

There are only three cases recorded where a cure can probably be claimed, and these are worth giving a little more in detail: Stack and Kretschman's case (1885) was a man 39 years of age with a tumor back of the pinna, probably originating in the mastoid process. It was removed with the electrocautery, cauterization being carried deeply into apparently healthy tissue. Sections showed a spindle celled sarcoma. There had been no recurrence at the time of the report, evidently over six months, though not over a year from the time of operation.

Botella's case was a woman 43 years of age, complaining of deafness in the right ear and head noises for four years, with later pain in the ear relieved by paracentesis. When seen by the author a mass presented in the canal, which was very soft and friable. Sections of small pieces removed showed a telangiectatic sarcoma. A radical operation was done and as granulations were seen coming from the attic, this region was completely cleaned out. Later dressings showed a few vegetations which were curetted, and a fungoid mass on the lower wall of the canal was canterized deeply. There was no recurrence after a year.

Santalo's case was a male 18 years of age, giving a history of an old discharge, and showing destruction of the tympanum and ossicles. He had had a recent hemorrhage from the meatus. A polypoid mass the size of a small hazelnut was seen attached to the inner wall of the tympanic cavity. It was removed and sections showed a sarcoma, apparently spindle celled. A radical removal was done, the attachment being curetted vigorously. The external wound healed in three weeks. A small lobule reappeared at the site of the previous tumor which was removed twice, sections showing sarcoma as before. Thorough curetting was again done.

There was no recurrence 21 months after the last operation.

Beck's case (1905) should be mentioned, though it is

doubtful whether the growth was malignant. Sections showed angioendothelioma, but it was encapsulated and firmer than the usual sarcoma. A radical removal was done with no recurrence.

Harris' case (2) (1917) is especially interesting in relation to the present report, as its history is suggestive of sarcoma, though sections of small fragments enabled the pathologist to diagnose it only as a "malignant growth," not specifying whether sarcomatous or carcinomatous. The patient was a clergyman, age not given, with a discharging ear and a mass in the canal. Part of this mass was removed, with recurrence in a year. At this time radium was used, twelve applications of from twenty to thirty minutes' duration being given in one year. At the end of a year, when the case was reported, the growth had decreased in size and the patient's facial paralysis had improved. Treatment was being continued at the time of the report.

Within the past four years I have seen three cases of primary sarcoma of the middle ear.

Case 1. Mr. W., age 33, farmer. Came to the office in October, 1916. History of discharging ear for two years, followed by pain and loss of hearing. A polypoid growth filled the middle ear. This bled freely at times. A portion of this growth was removed for microscopic examination and proved to be spindle celled sarcoma. The middle ear and the adjacent canal were thoroughly curetted. Two days later some new growth was observed, which partly covered the bone. At this time, October 21, 1916, 32 mg. of radium was inserted into the ear and left in position for two hours. November 1, 1916, 32 mg. of radium, time two hours. November 2, 1916, 32 mg. of radium, time two hours. On February 12, 1917, the patient returned, looking well, free from pain, having gained eighteen pounds. At this time he was again given radium treatment, 16 mg., time two hours. Total eight hours, or 224 mg. hours. On March 17, 1917, the patient writes: "This leaves me fine and dandy. I have not had a pain since the radium quit burning." The patient has returned several times for examination and on the last visit there was no sign of a return of the growth.

Case 2. Mr. B., age 53, farmer. Came to the office in February, 1917. He gave a history of having had a discharging ear for several years. Little pain until shortly before coming to office. At this time he had severe pain. A con-

dition was found very similar to case 1. Clinical diagnosis, sarcoma of the middle ear. An operation was advised. The middle ear was thoroughly curetted, also the adjacent canal. A specimen was sent to the laboratory for examination. The pathologist reported that the specimen was so macerated that a good section could not be obtained, and that he could not render a positive diagnosis, but advised to treat as malignant. The case was in every way strikingly similar to case 1. Two days after the operation there appeared some new growth of tissue. 32 mg. of radium was used, as in case 1, time one and one-half hours. The next day, February 27, 32 mg. of radium, time two and a half hours. February 28th, 32 mg. of radium, time two hours. On June 21st the patient returned very much improved in health. At this time 16 mg. of radium was used, time two hours. Total time, eight hours or 224 mg. hours. Paralysis of the facial nerve developed following the operation and radium treatment, which later disappeared.

Case 3. Mrs. M., aged 32, housewife. Came to the office in August, 1919. She gave a history of having had pain in her right ear when nine years old. At that time the pain was severe, lasting for several days, and was followed by discharge. This continued only a few days. At that time facial paralysis developed and still exists.

When she came to the office in October, 1919, she was suffering from severe pain in and around the right ear. Her family physician thought she had an acute mastoiditis. The pain was more severe anterior to the ear at times, but shifted, at times radiating down over the right shoulder. The patient was unable to sleep, pain increasing, she lost weight, and was unable to attend to her household duties. She was brought to the office barely able to walk. An examination revealed an object in the canal which had the appearance of an extremely bulging membrane, but of a bluish color. An operation was performed, much the same as for a radical mastoid. The mastoid cells were normal, except near the bridge, where the cells were absorbed, and the space filled with a polypoid mass. This mass filled the middle ear and extended into the petrous portion of the temporal bone. This was thoroughly curetted, exposing the internal carotid artery. The walls of the canal were smooth. A microscopic examination of this mass proved it to be fibrosarcoma. On September 24, 1919, the day following the operation, 32 mg. of radium was inserted and left in position nine hours. On September 26.

1919, 32 mg. of radium, time eight and a half hours. The patient has returned several times, and was given one more radium treatment, 16 mg., time four hours. Total, twenty-one and a half hours or 624 mg. hours. She suffered considerably from radium burn, which lasted for several weeks. Since then she has improved in general health, is free from pain, sleeps well, has gained in weight and is able to do her own housework.

Some observations and conclusions: In cases 1 and 2, radium tubes were placed in the canal and middle ear with the patient lying on his side with the diseased ear up. No screen, other than a silver tube, was used, the tube being pushed in as far as possible and the patient instructed to lie quietly until the required time had elapsed. In case 3 the tumor mass had penetrated deeply into the petrous portion of the temporal bone. Thirty-two mg. of radium was introduced into the ear and to the bottom of the canal in the petrous portion. Two tubes were used covered with rubber screen. The rubber tubes are said to cut off the secondary rays, which are very destructive and irritating. All of the patients suffered from radium burns. The immediate effect of the radium treatment was cessation of pain. The pain from the radium burn appeared several days later. Very little if any difference was observed between cases 1 and 2 with no rubber screen and case 3 which had the rubber screen, but cases 1 and 2 were given 224 mg. hours, while case 3 was given 624 mg. hours. Case 2 had a facial paralysis following the treatment which later disappeared.

Radium if applied in sufficient strength is said to destroy nerve function, but not the nerve fiber. Fifty mg. of radium was fastened on the back of the neck of a young rabbit. In twelve hours the rabbit was dead. Autopsy showed no change in the spinal column. The function had been paralyzed. Proximity to vital structure should be given careful consideration when applying radium.

One of our patients with sarcoma of the iris was treated with radium, the tube placed in position and stitched to the conjunctiva so as to be retained in the desired position at the margin of the cornea. The cornea was burned. The tumor gradually decreased in size until it had shrunk to a small nodule. The patient had been informed that there might be a return of the tumor, also that it might appear in some other location. He objected to having his eye removed, but later worried about the possibility of a recurrence, and insisted

upon its removal. This was done by Harold Gifford. This gave a rare opportunity of examining a sarcomatous tumor in an eye which had apparently been successfully treated by radium. The eye was sectioned by Sanford Gifford. Sections showed that the tumor had shrunk to a mere nodule, sections showing a spindle celled sarcoma but surrounded by fibrous tissue; no mitoses, and no extension into other parts of the eye. It was concluded that, while the tumor had not been completely destroyed, it had, according to the conception of Leon and Prime, been sterilized and rendered incapable of further extension.

Radiologists tell us that sarcomatous tissue responds to radium much better than carcinomatous tissue, and that the more rapidly growing tumors respond more readily than the slow growing type. In this group of 41 cases, fourteen occurred in children under the age of sixteen. These were all of the fast growing, very malignant type. All fatal within six weeks to eighteen months. It was also noted that operative interference increased the rapidity of the growth. It would seem, therefore, that radium would be the ideal treatment in these cases either with or without operative interference, and that had radium been used before metastasis occurred, some of these tumor growths might have been arrested. Hence the importance of an early diagnosis and treatment.

As to the method of administering and dose of radium, radiologists differ much. Hanson advocates large doses and short exposure with as little screening as possible for the superficial, and long exposure with screening when deep penetration is desired. Knox advocates smaller doses with longer exposures. Fatal toxemia has followed large doses of radium. The dose, time of exposure, method of administration and proximity to vital structures must all be carefully considered for the successful radium treatment. No one method is suitable for all cases.

In regard to the three cases cited above, while it may be too soon to say what the final result will be, at least this much can be said, that the radium treatment has retarded the growth of the tumor, the patients have been relieved of their mental agony and physical pain, have been given a new lease on life and possibly a permanent cure.

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## DISCUSSION

DR. B. F. ANDREWS, Chicago: The thing that has particularly impressed me in hearing this paper is the small number of primary sarcomas of the middle ear. I have never seen a case that was diagnosed as primary sarcoma of the middle ear, and I suspect if I questioned each of you, you would acknowledge that you had never seen one, and yet if there are forty-three cases on record the matter should claim our attention. The difficulty of making the diagnosis without the aid of the microscope is great, and even with the help of the microscope, I think it has been emphasized that we cannot always depend upon the microscopic findings. Here is a case in point: I had a patient from whom I removed a specimen which was taken to the laboratory. During the operation the specimen was submitted to the laboratory and the first report was "round cell sarcoma." The next day a supplemental report came in "carcinoma." We had three successive diagnoses from the same laboratory in three days on the same tissue. So, as has been suggested, I think the laboratory findings should be taken with considerable salt. I understand that the laboratory which made the diagnosis for Dr. Callfas was that of the University of Nebraska, which should be a good one.

There should be some treatment outside of radium. Roentgen rays have been used in some cases, but the rays should be diffuse. The radium can be applied to the tissue, and for that reason is more applicable in those cases.

DR. WILLIAM F. CALLFAS, Omaha, Nebr., (closing discussion): I



have nothing to add, except that Dr. Andrews in discussing the paper tried to be very brief, on account of lack of time, and gave me the wrong impression of what he meant to convey. What he intended to say, he has since told me, was that he considers the clinical findings better evidence than the microscopic examination—the same as a positive Wasserman test would be good evidence of the existence of syphilis, but a negative would not be positive proof that the disease did not exist.

## ANKYLOSIS OF THE TEMPORO-MANDIBULAR JOINT

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When we speak of ankylosis, the picture called before us is a more or less complete closure of the jaws, of months or years duration, with deformity of teeth and jaws and a receding chin. This, it is true, is the final result of a temporary ankylosis, and the degree of deformity depends upon the length of time that motion has been limited, or the extent of lesion or virulence of infection in original focus. We will, therefore, have from a small amount of connective tissue in the joint, to complete replacement of all normal tissue by scar tissue or bone, or by the same condition in the muscles of cheek.

The greater number are unilateral because the original lesion is practically always on one side, and on account of neglect the opposite side may subsequently become affected, because of disuse or secondary infection.

The large number of cases of temporary ankylosis seen daily by the medical and dental practitioners are not, as a rule, considered as probable precursors of the chronic, fibrous or bony types.

The literature pertaining to this subject, while not voluminous, is fairly well sprinkled through our journals of the last decade. The contributions are by men whose names suggest experience and judgment—J. B. Murphy, Dean, New of Rochester, and Blair; also many writers on plastic surgery, including some varieties affecting the cheeks and lips.

Etiology—The causes of permanent ankylosis are the same as those which produce temporary ankylosis, continued to the chronic stage—acute inflammatory exudate in the glenoid fossa from injury or extension from the parotid gland or ear—with the latter very small in number—represent most cases where articular surfaces or ligaments are affected. The joint itself is less frequently affected than the surrounding soft tissues.

Extension from peritonsillar abscess or abscess around the third molar directly into or around the internal pterygoid muscle is the most frequent route internally, with the exception of those cases where the mucosa of the cheek is destroyed in acute infection of the whole of the oral cavity. We may have further destruc-

tion of the whole thickness of the cheek by noma, as well as by infection of the parotid gland, which may destroy the gland or any portion of the cheek from the outside, or by injury to the cheek alone or simultaneous with fracture of the jaw.

#### CLASSIFICATIONS

(a) Bony ankylosis of the temporo-mandibular articulation and coronoid and zygomatic processes.

(b) Ankylosis due to cicatricial fixations in and about the joint.

(c) Fixations due to intraalveolar buccal, ramus alveolar and ramus zygomatic adhesions.

Most authorities agree that the majority of cases have their inception between the first and tenth years—this being given from 50 to 80 per cent. This depends upon the kind of cases encountered, as will also be found true when looking for the primary causes.

In groups of cases reported by different authors, one cause seems to predominate—for example, most of Murphy's and Kreuscher's cases were caused by extension from the ear, while other authors find very few of otitic origin.

Chubb recently reported five cases with 80 per cent of traumatic origin. Most of Roe's cases were due to trauma, while Blair and Lyons report 50 per cent, and Orlow as low as 30 per cent due to the same cause.

We may accept the above, and inflammation extending from the region of the tonsil and third molar as the causes of about 90 per cent of the bony and fibrous ankylosis affecting the joint proper; while the acute infectious diseases—diphtheria, scarlet fever, typhoid, dysentery and noma—account for most cases of intraalveolar and ramus zygomatic adhesions.

In cases of trauma, we have either a fracture of the neck of the condyle, of the posterior wall of the glenoid fossa or the roof of same. In the first instance, we may have the fragment turned upward, injuring the periosteum, covering the zygoma, as suggested by Roe, which would stimulate cicatricial tissue, which later might receive bony deposits.

In the second or third cases, we have injury to the auditory canal, middle ear, or possibly to the brain, which may show up later as infection in the middle ear or immediately by hemorrhage from the external auditory meatus. This latter would account for many cases which give a history of middle ear disease. However, the prevalence of middle ear suppuration in childhood with

the possibility of an open Glaserian fissure, admits of the possibility of the route of infection, especially in the cases where injury is so slight as to be forgotten, but may have lowered the vitality of the synovial membranes.

If direct injury to the bone has taken place, the proliferation of bone or other connective tissue cells, forming the callus, may be sufficient to at least limit the motion, even though this be ever so slight.

There may also be an inhibitory limiting of motion early in the condition, on account of pain.

Henderson claims that disease of the epiphysis of the condyle inhibits the growth of the bone and therefore the development of the jaw on the affected side. Whether this be true or whether the lack of development on the affected side is due to disuse and malocclusion produced by the injury, is a question for investigation. The deformity, whatever it is due to, is always present in the cases in which the history dates back to early childhood.

The receding chin, in either the unilateral or bilateral cases, is characteristic, although a certain amount of recession may be found in the ordinary mouth breathing child.

The deformity of the teeth, caused by the forcing of solid food between them, is only found in those affected from early childhood.

Difficulty in breathing may be due to normal development of the tongue, occupying an abnormally small space, but is more likely due to infection and irritation from improper orally prepared food, which produces congestion in the nasal as well as the oral and pharyngeal cavities.

#### OPERATIVE TREATMENT

The incision—as suggested by Murphy, Carr and others—for the cases of bony ankylosis, or fibrous conditions within the joint, we believe to be unnecessarily long and to endanger vessels and nerves which can be avoided with the author's incision.

The incision advised by Chubb, at the posterior border of the ramus, has been used by the author in one case, not for the reason for which Chubb advises it, but because of a prolonged infection which required drainage. If it is necessary to remove the coronoid process, as in Chubb's cases, his incision into the temporal fossa or an incision from within the mouth may be used.

We make one incision from the lower border of the zygoma to a point opposite the floor of the external auditory canal and three-fourths of an inch anterior to the tragus. This will not

wound the superficial temporal artery or the transverse facial, unless carried through the deep fascia. The parotid gland can be pulled downward and backward and there is no danger of wounding Stenson's duct. The incision ends just above the facial nerve and will not wound either the malar or infraorbital branches, and if care be exercised in separating the deeper tissues, we will have no paralysis and no sloughing of flaps, as the internal maxillary artery can usually be avoided by proper retractors. The method, in cases of bony or fibrous ankylosis is to either remove a small portion of the neck of the condyle, sufficient to allow free movement, or to remove the condyle completely. The deformity is somewhat greater when the entire condyle is removed, but not sufficient for the patient to complain of. We have never found it necessary to place facial flaps to prevent union and we have cases in which the joints have remained movable for years.

The wound is closed with deep sutures of fine catgut and the skin with fine silkworm or dermal, which can be removed in twenty-four to forty-eight hours, as there is very little tension. The jaw is opened as soon as the condyle is removed and if there is no interference with respiration, the gag is allowed to remain in place for several hours, at any event until the patient recovers from the anesthetic, and longer, if not painful. In case respiration is interfered with, the gag should be removed and jaw permitted to close. It has not been found necessary in any of my cases to use either the cork between the teeth, as suggested by Cabot, or the wedges used by Dean.

Opening of the jaws, at least once daily, first by operator or assistant, and later by patient himself, until voluntary movement is well established with sufficient opening, is necessary. As a rule it is not necessary to more than state this to a patient, but at times they will be neglectful.

The following cases are reported, as each is apparently from a different cause, although all can, we believe, be traced primarily to disease in the same region.

Case I. Mrs. G., age 22; referred by Dr. Sullivan.

Had been unable to open her jaws more than shown in figure for about eight years. This condition followed an abscess in the region of the lower right third molar. A number of recurrences took place during this period with gradual closing. Despite the almost complete closure of the jaws, to this time this patient had no decayed teeth, which speaks well for the use of the tooth brush.

The operation was simply a removal of a section from the neck of the condyle on the right, and the removal of the right

lower third molar on the same side. Recovery was uneventful excepting slight infection around one of the skin sutures. The opening of one and three-fourths inches has been maintained with no relapse.

CASE II. Miss N., age 20; referred by Dr. Parks, of Montrose. Gave history of extraction of both lower third molars, six weeks before following abscess, posterior to left. Swelling was slightly relieved, but recurred on left and was incised on two occasions and jaws opened, but no pus found.

Examination revealed an almost complete temporary ankylosis, opening of only about 1 cm. and that causing great pain. Skiagraph revealed nothing abnormal in joint or in body or ramus of jaw.

This condition continued for weeks and several openings were made, both intraorally and externally, finding pus on two occasions. The first, only streptococci were found, but when the second specimen was obtained from a small abscess, apparently only in the skin, microscopic examination revealed actinomycosis.

At no time could any disease of the bone be demonstrated either by X-ray or probe. Wassermann was negative on several tests. This patient did not stand K.I. well, either in small or large doses. However, she was at first given Burman's soluble iodine, which was later changed to Lugol's solution which she tolerated in large and increasing doses—the maximum dose being an ounce in water daily in three doses. This was given for five days with a five day interval; the patient receiving in all, 67 ounces of a practically 5% iodine (Burman's being about 4% solution and Lugol's about 5%), both being iodine in solution of potassium iodide. However, when the cure of actinomycosis was accomplished, the ankylosed condition still remained, but was not painful. Attempts at stretching the cicatricial bands were made, with and without anesthesia, but nothing was accomplished, unless to make the condition worse.

Operation consisted as usual, with the complete removal of the condyle, leaving slight deformity of depression below the zygoma. An opening of two inches was easily obtained and remains after two years.

CASE III. Mr. F., referred by Dr. Seybold. Gave history of abscess around right third molar and also of discharge from right ear, following removal of tonsils six years before. Upon examination was unable to separate jaws more than about 1½ cm., with swelling over right parotid gland, but no evidence of scar on right membrana tympani.



Fig. 1  
Complete fibrous ankylosis from ulceration of masseter muscle.



Fig. 2  
Child with ankylosis following fracture.



Fig. 3  
Ankylosis following sloughing of cheek from noma.



Fig. 4  
Case I before operation.



Fig. 5.  
Case I after operation.





Fig. 6  
Case II before operation.



Fig. 7.  
Case II after operation.



Fig. 8.  
Case III before operation.



Fig. 9.  
Case III after operation.

First operation consisted of removal of right lower impacted third molar and right upper third (not impacted), with the result that slight improvement took place for about four weeks. Swelling over parotid, which required opening, took place about this time and discharge from ear—which, upon examination was found issuing from a sinus into the canal anteriorly, at junction of cartilaginous and bony portions.

This condition persisted for several months with remission and exacerbation, until it finally healed completely. Ankylosis was gradually becoming worse, and patient, wishing to have it relieved, consulted Dr. New of Rochester and was referred back for operation.

Operation as usual, for complete removal of condyle and wound closed, but discharge from ear was noticed with pain over joint.

Two days later it became necessary to open below operative wound and into lower part of parotid gland for drainage. About three weeks later, my associate, Dr. Brown, removed a small flake from operative wound which opened spontaneously. This was either left at operation or separated from infection. After this, recovery was uneventful. Opening of  $2\frac{1}{2}$  inches has been maintained.

#### DISCUSSION

DR. J. F. BARNHILL, Indianapolis, Indiana: The type of Dr. Carmody's case is such that his description of it is necessarily a description of the anatomy of a complicated region and of an operation on this region for the repair of a very troublesome disease. Dr. Carmody is to be congratulated on the result he shows in the pictures. It has been my privilege to do a few of these operations, and I recall the very great patience that is required to do the work and the greater patience necessary to follow it to the happy end the essayist secured. The paper speaks entirely for itself and since it is not strictly along the path of orthodox oto-laryngology, it points a way perhaps that we are shortly to follow. I believe it will not be long until we will be designated "head surgeons" and not oto-laryngologists, and the new name will be more indicative of the field of surgery which the oto-laryngologist should cover. Each annual meeting of the large American associations makes this trend more evident, and papers like Dr. Carmody's should give confidence that the assumption to the broader field is not made without adequate preparation.

DR. JOSEPH C. BECK, Chicago: I wish to go on discussing with what Dr. Barnhill said. I did not get in time to hear the paper, but I have discussed the question with Dr. Carmody many times. It is, as he no doubt brought out, of otologic interest primarily. In the cases that have come under my observation, most of them come subsequent to otitis externa, with great involvement of that mandib-

ular joint, and it is in reference to the prevention of this state that I wish to speak, and not regarding the plastic so excellently presented by Dr. Carmody.

The symptom you most frequently find present is the limited motion of the lower jaw. If you permit this external inflammation to go on you can have, especially in children, late ankylosis that you could have prevented by very active manipulation, that is, active and passive motion, after treatment to the otitis externa.

The plastic, that I believe gives the best result is within the ability of anyone who knows the pathology. I do not know the one Dr. Carmody prefers, but I perform a submucous opening entering behind the jaw over the posterior border of the ramus and go immediately below the periosteum of the jaw in the course of the inferior maxillary branch as it becomes the dental. With a retractor hold the nerve toward the pharynx, while severing the ramus of the lower jaw by means of an electrically driven burr. The burr point should be oval and its action should be permitted to go on until the periosteum is reached over the external surface of the ramus. One then passes a wire (silver No. 1) about this periosteum in the shape of a loop and attempts to get it in between the two fragments of the ramus just severed by the burr, preventing bony union and producing a new joint.

The plastic operations described by Murphy and others have left me in the lurch, when expecting free mobility of the jaw.

DR. T. E. CARMODY, Denver, Colo., (closing discussion); I have only one or two words to add. The incision that Dr. Beck proposes is the same as that recommended by Chubb in the British Medical Journal recently, and gives good drainage, but I think we get more of a scar.

I am glad Dr. Beck agrees with me in not requiring any flaps. It is not necessary to turn these flaps in toward the ends of the bone. In cases where we remove the condyle it is not necessary, and we do not use them when we remove small sections.

I wish to call attention to Case II, a little more fully, and this is in relation to the use the patient made of iodine. Some cases take it very well and this patient took sixty-seven ounces of a 5 per cent solution in three months.

Dr. Beck also spoke of middle ear disease and, as I said before, if you examine them you will find that there is no scar in the membrana tympani at all, but in the canal.

## LOCAL ANESTHESIA FOR EAR, NOSE AND THROAT OPERATIONS

ALBIN M. PAINTER, M.D.

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Local anesthesia is accomplished by contact with the peripheral nerve endings or by nerve blocking, either by infiltration or topical application. Where topical application is sufficient, infiltration is contraindicated because of the added tissue trauma. For the same reason, where nerve blocking is sufficient, peripheral nerve contact is contraindicated. Therefore, where possible, nerve blocking by topical application is ideal.

Intranasal surgery presents a field more suitable to this method of anesthesia than any other region of the human anatomy. The nerve supply is definite. Accompanied by the blood vessels, entrance is made to the nasal cavity at points of easy access, where they can be controlled together. They are but superficially covered by mucous membrane, the absorptive power of which together with the marked vasoconstriction effect of the cocain and adrenalin make possible the rapid preparation of an anesthetized and ischemic field in which to work.

Nerve blocking by topical application as first described by me in the Journal of The American Medical Association, January 8, 1916, after three years of use, is briefly as follows: Four light weight applicators are prepared in the usual manner and dipped into adrenalin, the excess being briskly shaken off. They are then rubbed into flake cocain, making a paste or cocain mud, as described by Dr. Freer. The excess is rubbed off so no dry crystals are left to be inhaled, or particles of the paste to be washed off by the nasal secretions, and later absorbed. These applicators are introduced in rapid succession as follows: One on each side as far anteriorly and as high up in the nasal cavity as possible, where they reach the anterior nasal nerves directly upon their exit through the anterior ethmoidal foramina. The other two, one on each side, are introduced between the septum and the middle turbinate on a line with the normal vomer crest, until they reach obstruction directly back of the posterior tip of the middle turbinate. Here they are in close proximity, if not in actual contact, with the sphenopalatine ganglion. The path of the cotton applicator bisects the posterior nasal nerve

in its passage downward and forward over the septum. Complete anesthesia for septal work by this method is attained within two to five minutes. More time is required for outer wall operations as described by Dr. Sluder. Application of the paste is made over the line of incision for septal work unless the skin area is included, in which case the use of the hypodermic becomes necessary, not only to control the nerve supply but hemorrhage as well. Failure to obtain anesthesia by this method is due to faulty technic, either going too far posteriorly for the anterior nasal nerve, or failing to extend far enough back, or going too low in the posterior nares. The applicators may need to be replaced as above shown.

The advantages of this method are as follows: It minimizes the amount of drug required and limits its absorption, confines the application to a small area and saves time, which is an important factor. One's patient is ready for the operative work to start much sooner and in a far better physical and mental condition.

Nerve blocking for throat operations, even operations upon the tonsil is not easy to accomplish. In many cases one will find the throat in the tonsillar region fairly well cocainized by the application to the sphenopalatine ganglion. Cocainization of this is not advocated for this procedure, on account of disturbing the functions of surrounding areas, motor as well as sensory. The nearest approach to nerve blocking is the method of injecting the palatine nerves at their exit through the palatine foramina as advised by Dr. Sidney Yankauer, in the *Laryngoscope*, May, 1909. It also has some of these objectionable features. Besides the glossopharyngeal is still to be dealt with, and it undoubtedly has sensory fibers which anastomosing with the palatine nerves forms the *circulus tonsillaris*. In removing the tonsil, I was struck with the constant appearance of a fan shape fascia attached along the entire posterior surface of the tonsil, bisecting the posterior surface perpendicularly. As I could find no mention of it in the literature, had decided it was the junction of the fascia of the palato-glossus and the palato-pharyngeus, and had named it the "Suspensory Ligament" of the tonsil. I appealed to Dr. Frank J. Hall of our city for aid and received the following excellent description, not only satisfactorily explaining this anatomic structure, but also giving a new theory of tonsillar development upon which more will be written at a later date.

"The tonsil is a herniated lymph node, conforming in all essential structural anatomy to any other lymph node of the

body. The hernia sac is a definite fibrous capsule which completely surrounds the gland and is not apparently perforated at any point by blood-vessels, nerves or lymph channels, save at its base or hylum. The structure above referred to is without doubt the hylum of the lymph node, and besides bearing the lymphatics, nerve and blood supply, furnishes the main attachment of the gland to its surrounding structures, the muscular bed or fossa. It may be that it is through this fold of tissue that unerupted particles of lymph tissue later make their appearance after the restraining influence of the tonsil has been removed, though this should not be relied upon as an alibi whenever tonsils seem to have grown again."

With this anatomic arrangement in mind, the following technic has been developed. The throat reflexes are first abolished by application of cocain mud, the line of incision being given special attention. The applicator is then firmly held against the tonsil just posterior to the base of the anterior pillar, as this is the point of entrance with the needle, and the line of cleavage between the tonsillar capsule and the muscle fascia is here best attained, as they separate to follow the gland and the muscle fibers. A special needle closed on the point with an opening placed one-eighth of an inch posteriorly is used. The needle is inserted with opening toward the tonsil, the surface of which it hugs closely, and the plunger is slowly driven home as the needle dissects its way around behind the tonsil. The solution used is one-tenth of one per cent cocain. The idea of injecting in this space is not new and is attempted in many ways. One will often open into the solution still walled off, showing that there is a decided tendency to prevent deep muscle infiltration. Two injections are found necessary as a routine, the other one being placed between the capsule and the posterior pillar, near the lower pole of the tonsil. An application of the cocain paste may be required along the suspensory ligament as the dissection proceeds, but this is not usually the case. Large freely movable tonsils, not covered by plica may easily be removed by progressive topical application of cocain paste, thus reducing the trauma of the anesthetic and greatly lessening the suffering later as the anesthesia is leaving the tissues.

For the middle ear, the regular mixture of cocain, phenol and menthol crystals, equal parts, has no superior. Its use on a cotton applicator against the membrana tympani is as painful as the cutting. It is best applied with a small dropper or pipet,

cocain mud having been previously applied to the tubal region through the inferior meatus.

As to the various methods, drugs and so forth, one dare not presume at this time to do other than refer to the most excellent report of the committee appointed from our section of the A. M. A., which is a valuable addition to the literature on this important subject. As a scientific research and a classification of our knowledge it is an historical landmark. Their summaries and advice will be sanctioned as final authority. It is a crowning act of our specialty in their great work of stabilizing local anesthesia and putting it upon the high plane it so justly deserves.

In return the specialist has greatly benefitted by having, through the use of local anesthesia, developed a higher regard for and a more intimate knowledge of the tissues, and greater skill in handling them.

## DISCUSSION

DR. HAROLD M. HAYS, New York City: It is almost impossible to discuss this paper of Dr. Painter's from any critical point of view. There is no question that the majority of us are using local anesthetics for operations on the nose and throat more and more. This holds particularly true for tonsil operations on adults. There are some men in the East who won't do a tonsil operation on an adult except under local anesthesia. Having known Dr. Painter for a number of years, I feel that the results that he has obtained are all that can be desired and far better than most of us obtain. It seems almost inconceivable that cocaineizing the upper regions of the nose is sufficient for nasal operations. I wonder if this method of nerve blocking is sufficient to control the hemorrhage. The time is coming in our nasal work, or has come, when we feel that the particular thing is to be able to see every point that we are working on. In other words, the anesthesia and the ischemia must be so perfect that we never have to work in the dark. There is no excuse for chopping away the ethmoid cells the way we used to; for now, by proper nerve blocking we should be able to have a bloodless field which allows us to work with precision. I personally am never satisfied, when operating within the nasal cavity, unless I have an absolutely bloodless field. Recently, a book on local anesthesia has been translated from the French, which shows that almost any operation can be performed on any part of the body under proper administration of a local anesthetic better than under general anesthesia, even operations as severe as the removal of a tumor of the brain.

I think that we have learned a great deal from the oral surgeon who is able to block off the nerves of the jaw with the greatest ease. I have often wondered whether it was not possible to block off the nerves of the nasal cavity in the same way. A number of years ago, I began the blocking method in the nose by the infiltration of dilute cocain and adrenalin under the mucoperiosteum, and there is no doubt,



with the patient under this anesthesia, one gets a perfect ischemia which allows him to work with the greatest facility. Anesthesia cannot be produced in a moment. It requires four to five minutes. The infiltration, if properly done, does most of the dissection for you, in a submucous resection, and therefore the operation is much easier.

I was greatly impressed with the description of the technic of the anesthesia of the tonsil which Dr. Painter gave. Apparently he does not infiltrate the pillars and therefore there is no traumatism to them. This in itself is a great thing for it means that there is no edema of the pillars afterwards. Moreover at the time of operation, the anatomic relationships are not disturbed.

DR. H. E. THOMASON, Kansas City, Mo.: In 1914 I first met Dr. Painter, then of Youngstown, Ohio. He was in the city and told me he would like to demonstrate a method by which he felt that we could do these intranasal operations with the least amount of pain and the least amount of hemorrhage. He explained this method to me and, fortunately, we had a case for submucous resection, upon which he demonstrated his method. After applying the wisps of cotton with cocaine and at the four points, the principle one being Mackel's ganglion, he immediately removed these applicators and invited me to commence my operation, which was about two minutes from the time he inserted his first application. I was a little skeptical and doubtful if this would prove to be of anesthetic value. I started the operation, however, making the incision in the mucous membrane and proceeding in the usual way, and to my surprise there was no pain and very little hemorrhage. The result was that I have been using that method ever since—not only in resections, but in turbinectomies, in the ethmoid, and in opening the lateral walls into the maxillary sinus. The turbinates and the lateral walls are not anesthetized so quickly as the septum, but I assure you that any operation done within the nasal cavity is performed with less pain and less bleeding with the nerve-blocking method than with any other.

DR. J. A. PRATT, Minneapolis, Minn.: I wish to emphasize the remarks of the two previous doctors. Four years ago I saw Dr. Lorie do this blocking system here, and since then have been using that method for all operations in submucous resections. Not for turbinates, for we do not remove turbinates. We allow the blocking system to remain in place for twenty minutes before starting the operation. In exenterating the ethmoid, I have practically had no bleeding. The principal thing, I think, is to permit it to remain long enough, and we always allow twenty minutes before we start.

DR. JAMES J. KING, New York City. I wish to congratulate Dr. Painter on his work. I cannot speak from experience of his methods, but from my knowledge of Dr. Painter's work I appreciate what he has done. I think the time has come to do more and more work under local anesthesia and there are one or two points which I wish to emphasize, without going into details about the methods I use myself.

In the first place, I think it is very desirable to give the patient an anodyne of some sort to quiet him down a little and allay the fear of the operation. That this goes a long way has been demon-

strated by work on dogs by Gwathmey and Hatcher. These dogs, which had an opiate, before the operation, were operated in much better shape than the dogs operated without an opiate. So much for that, but I recommend that morphin be given preliminary to local anesthesia.

The next point is a question of operating on a patient in a position where the strain will be the least, either in the recumbent or semi-recumbent. This also works for good results. I have operated on many patients under local anesthesia in nose and throat, and we have had very little trouble with pain and bleeding in the methods which we use. Frequently when using a general anesthetic, the patient is coughing and gagging right along through the whole operation, while under local anesthesia the reflexes are abolished and there is no coughing or spitting.

I use a method by first painting with cocain solution, after the preliminary morphin has been given, and then infiltrate with 1/5 of 1 per cent cocain solution with adrenalin. The fine needle allows you to get a splendid anesthesia with the minimum amount of solution. I use a very fine needle of the Luer type, and this allows me to do two to four operations with one ounce of solution.

DR. A. H. ANDREWS, Chicago, Ill.: First, with regard to dry cocain, it should be used so that the patient will not inhale it. I have been using dry cocain for more than a dozen years. At first I bitterly opposed it, then adopted it and now advocate it. If it is properly applied there is no danger of having it inhaled or blown away.

In regard to bleeding, with the use of dry cocain applied to the septum, we have very little trouble with hemorrhage until we get down to the mandibular ridge. There is where we get the greatest amount of hemorrhage, and no amount of anesthetic put in above that will stop it if we go down there at all.

With regard to a hypodermic of morphin, for a year I have used about one-third of the full anesthetic dose of morphin and scopolamin. The patients come to the operating room and don't care much what you do to them. They are happy and do as they are told, and this has accomplished much more than the hypodermic did formerly when the injection was not used.

I have never been able to anesthetize the mucous membrane on the antral side of the wall very well. There is always a certain amount of discomfort, and in removing the turbinates there is usually enough traction or strain on the side of the turbinate to get some discomfort, and not on the turbinate itself.

I would like to suggest to the doctor from New York that some of the western operators go over there and give a demonstration.

DR. HENRY G. MUNDT, Chicago: There was for a long time fear in my mind regarding the use of powdered cocain for anesthesia, because I feared it was not clean. Now I have learned that there is a method of securing clean cocain, and that is by pouring benzine over the cocain and allowing it to evaporate. Then you have clean cocain. I always wondered whether the cocain was clean, but now I know it is.

DR. ALBIN M. PAINTER, Kansas City, Mo., (closing discussion): First, in answer to Dr. Hays regarding hemorrhage. If our operative work is completed within the ischemic time limit, there should be no hemorrhage. I think the method produces a more profound ischemia, though perhaps not as lasting.

Dr. John Leshure proved by experiments on frogs, that strong cocain reaches the vessels in sufficient strength to exert a strong vasoconstrictor effect, while weak solutions are taken up by the vessels. The anesthetic should conform to the technic of the operation.

Dr. Andrews probably overlooked the fact that the use of the hypo was recommended for the skin area. Hemorrhage from the cancellous bone is best controlled by crushing the bone with forceps.

The idea of sterilizing cocain with benzine is new to me. Cocain furnished us in service had a benzine odor and it seemed the stronger the odor the less effective the cocain.

## THE INFERIOR TURBINATE ON TRIAL AS AN OBSTRUCTIONIST

HAROLD BAILEY, M.D.

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During the past several years the writer has seen much surgery of the inferior turbinate that has been so at variance with his own ideas that he has seized upon this opportunity to open up the subject for a general discussion.

In years gone by, among a certain class of specialists, the surgery of the nose resolved itself into a question of whether the inferior turbinate should be cauterized by chemicals or by electricity. The debate was generally decided in favor of the latter. More recently the electric cautery has been under the fire of criticism by those who condemn its use entirely, and hold that the offending turbinate should be attacked not with fire but by the sword. In the hands of the writer the cautery has always proven itself a very warm friend, and it is his opinion that its use is to be encouraged while only its misuse is to be condemned.

Modern text books on the nose have very little to say about the inferior turbinate. Doubtless the authors think the subject so well understood that passing comment is sufficient.

It is a difficult matter to define clearly a normal inferior turbinate. Possibly no two of us would describe it exactly alike, for the reason that very few, if any, normal turbinates **are** exactly alike. It will serve the purpose of this paper to say that it is a distinct scroll-like bone situated in the lower recess of the nose; that it is attached to the lateral bony nasal wall at its upper-outer aspect; that it extends from just within the vestibule to the naso-pharynx. It should hang free in the nose so that there should be no contact between itself and the septum, nor between itself and the nasal floor, nor between itself and the lateral nasal wall except at its point of attachment above. (See Fig. 1.) It has a covering of mucous membrane, beneath which is found a goodly supply of veins and cavernous spaces. Erectile tissue comprises an important part of the structure, and predominates along the lower border and at the posterior end. Any lower turbinate conforming to these specifications remains a harmless and

law-abiding individual. The fact that he contains so much erectile tissue makes him particularly irritable when exposed to dust and sudden climatic changes, and he is often prone to puff up beyond the limits of good behavior, to the annoyance and inconvenience of his host. These offenses are usually slight and of short duration at first and may be readily forgiven. It frequently happens, however, that having taken

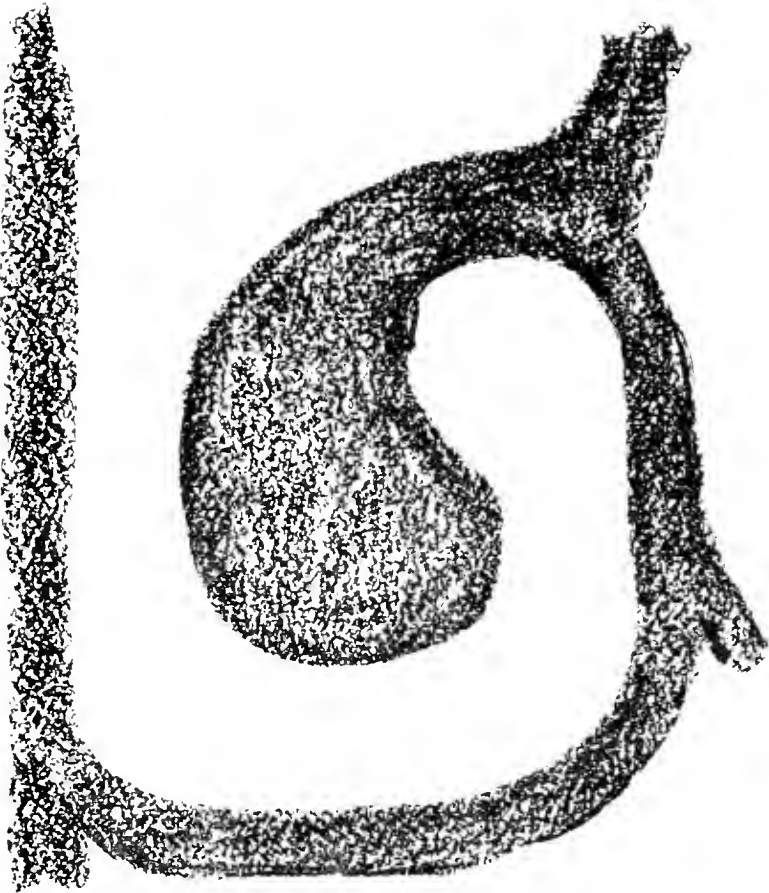


Fig. 1.

Inferior turbinate conforming to normal specifications.

a few slight liberties of this kind, he soon forms the habit and swells more and more with less and less provocation and becomes a positive nuisance. He teaches his companion of the opposite side the same bad tricks, and unless placed under proper restraint conditions get so bad that one or the other

of them is full a good share of the time, and sometimes both at once. They are particularly prone to start their carousals at night. The poor patient goes to bed, rolls over on his right side and dozes off to sleep, only to be awakened by the lower turbinal on the same side getting full and disorderly and blocking the air traffic in the corresponding nostril. Our patient is awakened by the disturbance, then rolls over on the other side, hoping that the disturber of his peace will quiet down. This he promptly does. Unfortunately, however, the lower turbinate on the other side seizes the opportunity and himself follows the bad example of his companion on the right. In this manner one nostril or the other is stopped up most of the night. To make a bad matter worse, if allowed to persist in their waywardness, these two offenders will both get full at the same time, and in order to obtain any sleep at all the restless individual must needs keep his mouth open. This again starts more trouble. The poor man's pharynx, not being accustomed to sleeping in a draught, promptly catches cold. His companion, the larynx, occupying the lower berth, contracts a cold from him and protests in a hoarse voice, all because somebody left his mouth open when he went to sleep. This would appear to be calamity enough to follow the carousals of a pair of drunken toppers such as our inferior turbinates have now become. I regret to state that the mischief has only just commenced. They have not only blocked the air traffic through the nose, but have in addition closed the windows upon which the middle ears depended for their ventilation. The middle ear stands it as long as his endurance will permit, and then he in turn sets up a cry, mild and at infrequent intervals at first, but later growing into a loud and continuous roar for more air. We call this roar a tinnitus, but the term is too mild to describe the condition. It is at this stage of our story that our patient, having put up with all that human endurance can permit, calls upon the specialist and files his plea of complaint. We listen to the evidence, examine the culprit thoroughly and then view the damage which he has committed. It sometimes happens that when we examine the patient we find our little turbinate quite sober and inoffensive looking. We look at him in front and then behind and we wonder if possibly the patient is not mistaken. We adjourn court and postpone the trial for a week, and the next time this same turbinate appears before us he is an entirely different individual. He is so full he lies lengthwise

in the street, blocking the traffic at both ends. There is no circumstantial evidence about this. He is guilty, caught red-handed in the act, and no extenuating circumstances such as an acute rhinitis, deviated septum, or hay fever are present to be set up in his defense. He is convicted, sentence pronounced and court adjourned. It sometimes happens that the

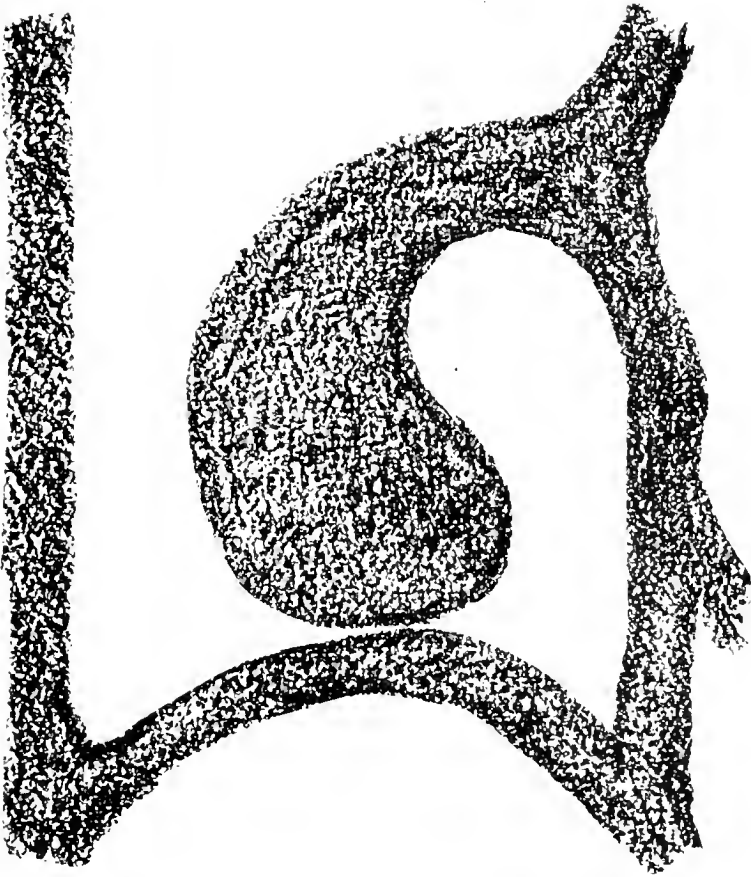


Fig. 2.

High arch of the hard palate encroaching upon the inferior meatus.

inferior turbinate is blamed for offenses of which he is innocent. We cannot be too careful in passing sentence, because each case is different from the other, and the best and most unbiased judgment should prevail.

For example, a child is brought in entering the usual complaint of a nasal obstruction. We examine the nose and find

on one side the lower turbinate blocks the nostril. We find, however, that this child has a mass of adenoids partially blocking the nares behind. To hastily condemn the turbinate in this case would be a miscarriage of justice. This turbinate has fallen into bad company and has been coerced into committing a crime for which he is not primarily responsible. Soon after his malicious adenoid companion is removed he

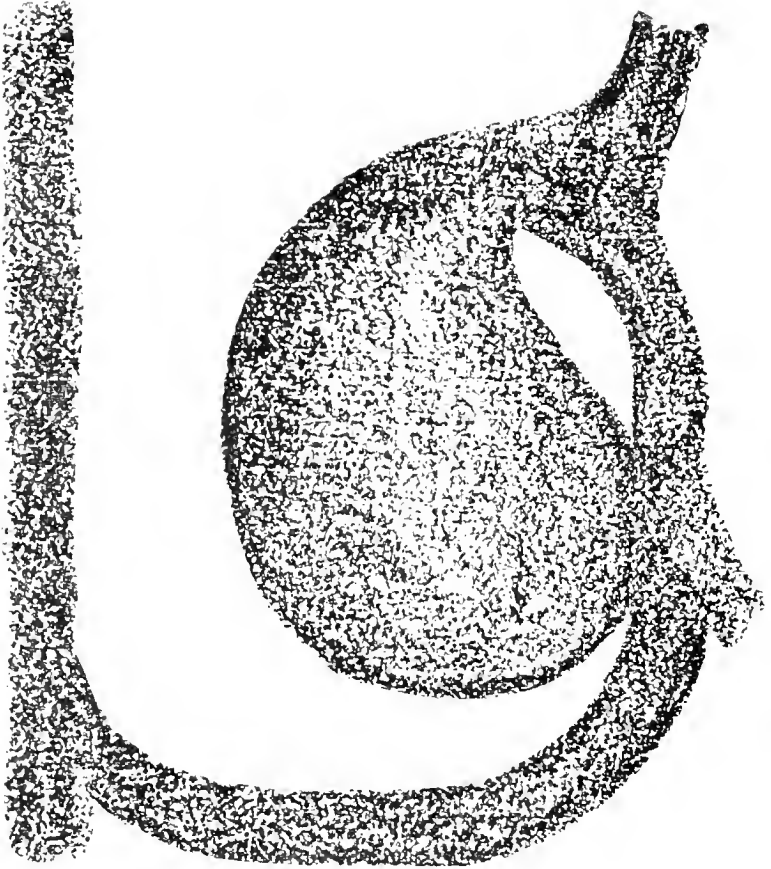


Fig. 3.

Turbinal hypertrophy with adhesion to the lateral nasal wall.

will straighten up and behave himself. In case he should not do so he can receive attention later.

Again we find the case of a child, say fourteen years of age, with a nasal obstruction. Examination shows the inferior turbinate blocking the nostril. This child also has a few adenoids high up in the nasopharynx, but with plenty of



room underneath for air circulation. We may remove the adenoids in this case and get slight or no improvement in the breathing. We examine further and we find the roof of the mouth, the arch of the hard palate, pushed high up, encroaching to a marked extent upon the inferior meatus. (See Fig. 2.) This affords one of the many examples in which the adenoids were removed too late in life to give the child the full

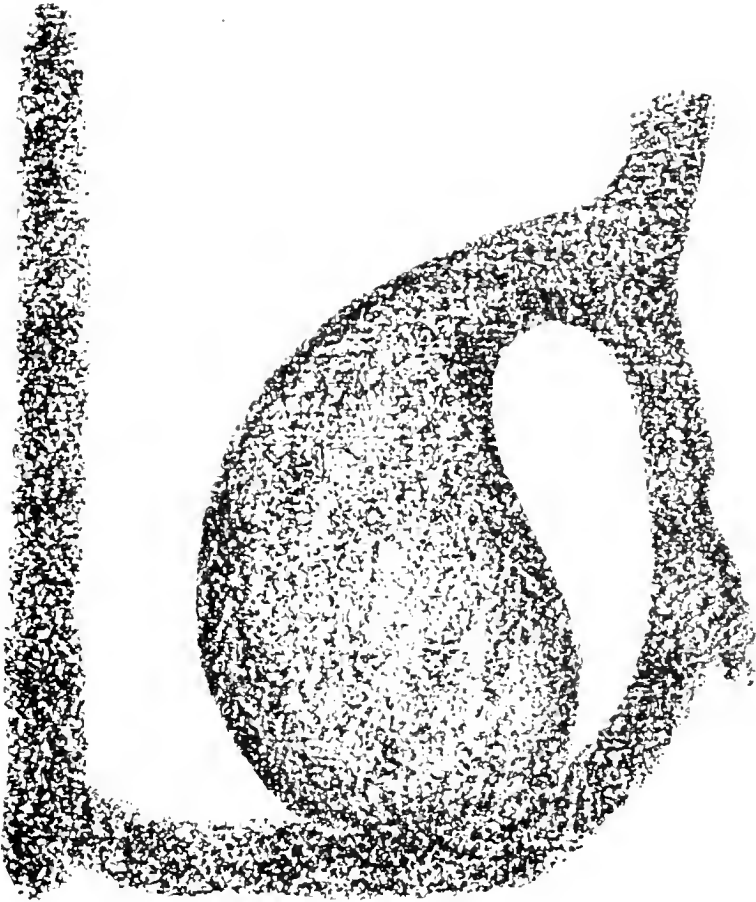


Fig. 4.

Turbinal hypertrophy resting on the nasal floor.

benefits he would have derived from the same operation performed eight or nine years earlier. Here we have a normal turbinate acting as an abnormal one. He obstructs the traffic not because he is too full, but because the street is too narrow.

It may happen that it is impossible to widen the street, and we are forced to resort to operation on a normal structure to improve a condition for which he is in no wise to blame.

I will now cite a case in which the inferior turbinate blocks the nose, but the obstruction is largely due to the fact that the nostril is narrowed from a deflected septum encroaching upon the turbinate. (See Fig. 5.) Obviously here the sep-

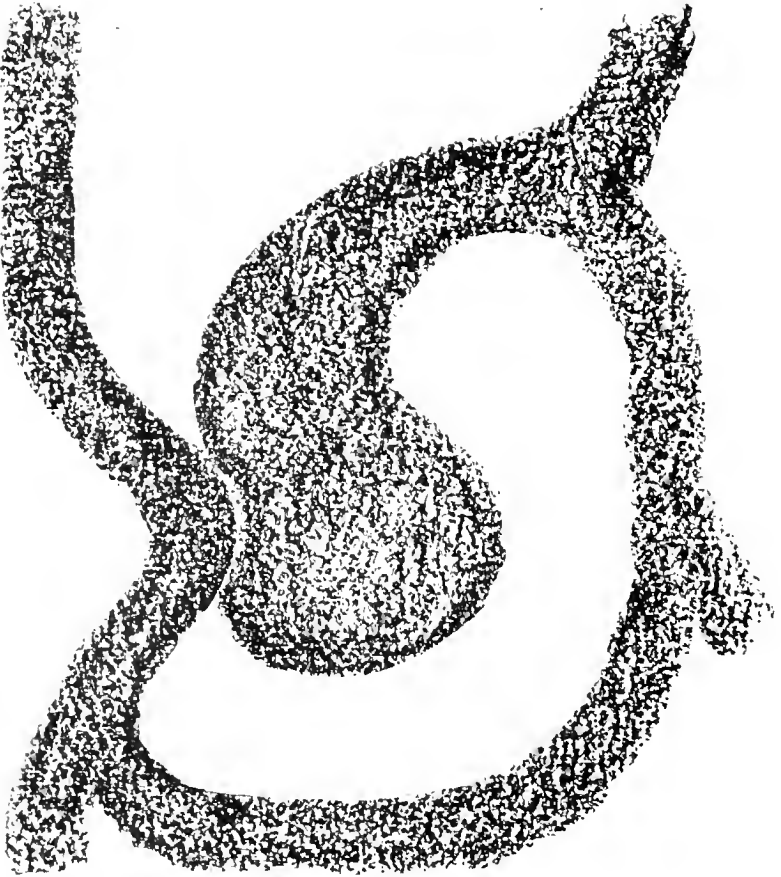


Fig. 5.

Deviated septum encroaching upon the inferior meatus.

tum is the guilty party, and should be dealt with, leaving the inferior turbinate unmolested. The same ruling applies in cases of septal spur or crests without deviation. In such noses we examine the opposite nostril, and we find a marked enlargement of the inferior turbinate, almost stopping the

nostril and nearly filling the concavity of the septum. (See Fig. 6.) It is evident here that straightening the septum will relieve the obstruction in the nostril encroached upon by the concavity, but will as surely at the same time cause an obstruction of the opposite nostril in which the inferior turbinate had undergone a compensatory hypertrophy. It would

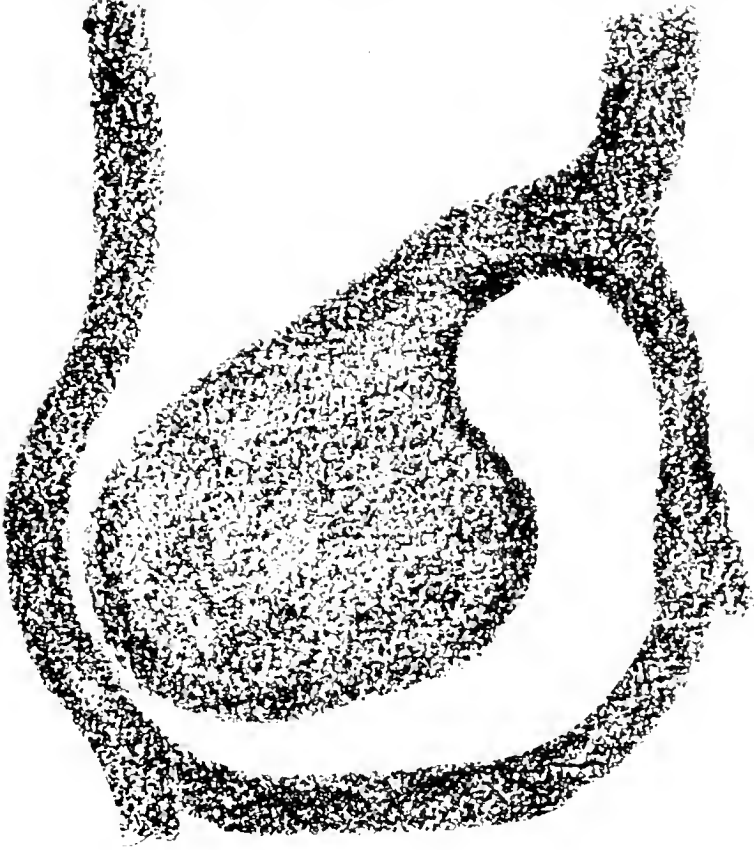


Fig. 6.

Inferior turbinate showing a compensatory hypertrophy. Septum deflected to the opposite side.

seem that a turbinate that gradually enlarged to compensate for the concavity left by a deviated septum would in time gradually shrink to its former normal dimensions after that septum had been straightened. I am not at all satisfied in my own mind that this actually takes place. It does in part, I will admit. The question is whether or not we shall wait for this to occur, leaving our patient all this time with one

nostril made better and the other nostril made worse. It has been and still is my practice to do something for this condition as soon as the swelling following the septal operation has completely subsided. It has never seemed to me advisable to use a cutting operation for the reason that the effect is permanent after such a procedure, and in time it may leave too much room in the nostril. This is purely a theoretic objection with me, and may be entirely wrong. It has been my practice to make use of the cautery. The transient improvement which follows a cautery operation is a serious objection in dealing with most hypertrophies in the nose, but in the case of a compensatory hypertrophy, where a transient result is all that you desire, it has appealed to me to be the operation of choice. The effects last for about a year, which gives the compensatory hypertrophy time to disappear. I know many good authorities condemn the use of the cautery in the nose for hypertrophic rhinitis, and they tell us that it makes for much scarring and dryness following. This is mostly theoretic and partly due to errors in judgment in using a cautery or to error in technic. If you cauterize too much and too broad a surface, you can cause all these bad effects. If you do not attempt to cauterize too much, but use your cautery at too low a heat, you will get the same bad results. If you use the cautery wire at a bright red heat, not a white heat and not a dull red heat, you can then make a quick linear incision along your turbinate down to the bone without damaging much adjacent mucous membrane. To do this effectually you must, of course, refrain from turning on your cautery until you have your tip in place in the nose and pressing firmly against the point to be cauterized. Immediately the current is connected the wire cuts deeply into the turbinate, and as you draw it forward cuts quickly the narrow linear groove desired without devitalizing any expanse of mucous membrane. With a dull red heat it takes so long for your wire to cut deeply into the turbinate that much mucous membrane above and below the wire becomes charred and eventually sloughs. I mention this in detail because I have seen some bad cautery work done by myself and others through not observing these simple precautions.

There is another class of noses which we sometimes see in which the middle turbinate is so enlarged and extends so low, especially at the back, that it encroaches on the inferior meatus and we must be careful here that the cutting opera-

tion either by scissors or snare is applied to the offending middle turbinate rather than to the inferior one which is innocent. Inferior turbinate hypertrophies associated with acute rhinitis are of course transient in duration and do not come up for consideration in this paper. Those periodical hypertrophies associated with the menstrual period, as well as those belonging to the passive congestion group caused by circulatory disturbance of cardiac, hepatic or renal origin, have also been purposely omitted.

Of more than passing interest to the rhinologist is that large class of sufferers whose symptom complex is more generally recognized by the popular appellation of Hay Fever, or Hyperesthetic Rhinitis. Here the middle turbinate is usually first involved, and often the only one in the milder cases. In others the lowers also share in the general edema. The symptoms in this disease are so distressing to the patient that he is willing to submit to any operation promising him relief. Many of these cases are operative ones, but this does not necessarily mean that they should be operated during the height of an attack. On the contrary, the prevailing opinion would choose the interval between attacks in which to carry out any surgical treatment indicated, for at this time one can form the best conception of the amount of tissue to be removed. With this objection laid aside, there does not seem to be any serious contraindication to operating during the attack. The wounds seem to heal nicely and the postoperative reaction appears no more severe than at any other time.

The use of the cautery for shrinking these turgescient lower turbinates has been recommended by many good authorities, and still remains a popular procedure. Trimming up the lower margins with the scissors will also afford considerable relief. Caution and good judgment are required lest too much tissue be removed and the gratitude of the patient terminate with his hay fever.

A form of lower turbinal hypertrophy quite frequently overlooked or disregarded by the surgeon is that involving chiefly the posterior end. These may be either the usual smooth surfaced enlargements, or those described as the mulberry or cauliflower hypertrophy. (See Fig. 7.) These conditions are so frequently associated with chronic nonsuppurative middle ear catarrh that their removal appears to be indicated where this disease is present. In fact, it does not seem a too radical procedure to practice their removal prior to

the onset of the middle ear symptoms, done simply as a prophylactic measure.

Having tried and condemned the subject of this paper on these several different counts, it now remains for us to pass sentence best befitting the crime, and to determine the procedure most suitable for its execution. It is an unfortunate fact that those operations on the lower turbinal body which

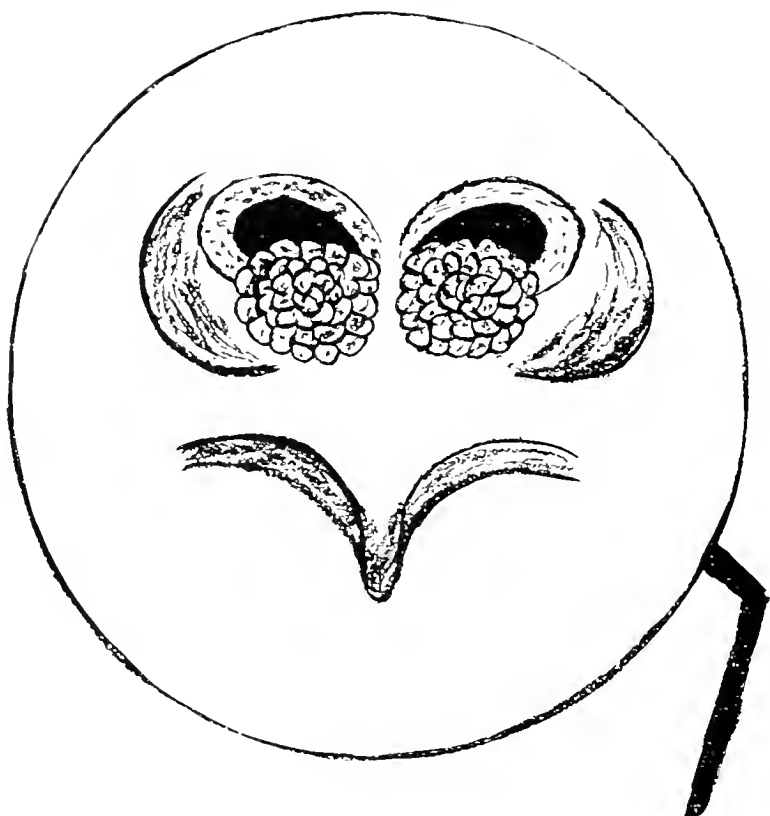


Fig. 7.

Inferior turbinates with polypoid hypertrophy of the posterior ends.

are the most conservative are the most difficult to perform. It is very seldom indeed that one finds any occasion for a complete inferior turbinectomy, yet such an operation is infinitely easier to do than is the careful, well executed turbinotomy. The reason for this is purely anatomic. (See Fig. 1.) The narrow, bony attachment to the nasal wall is so easily severed either by the scissors or by the spoke shave or the saw that the temptation has in the past been too strong for some opera-

tors to resist. Even at the present time we occasionally find surgeons holding over from the century preceding who continue to practice as a routine this simple operation, so uncomplicated in its execution, yet so certain to be followed by complications most unpleasant for the patient.

Where the bone lies in firm contact with the lateral nasal wall (see Fig. 3) it may be dealt with either by removing the offending portion with the scissors, or by inserting scissors or forceps underneath and prying loose the bone with sufficient force to produce a green stick fracture of the bone at its superior normal attachment. I believe this last trifling operation is an exceedingly valuable one in some selected cases. It is also an excellent method preliminary to the removal of the inferior margin of the bone, where there is insufficient room to insert the outer blade of the scissors between the turbinal and the nasal wall. This latter operation is of course the one of choice in those cases where the hypertrophy rests on the nasal floor. (See Fig. 4). These afford the more common form of hypertrophy, requiring the removal of enough tissue to keep the air space free above the floor.

It not infrequently happens that the hypertrophy is pronounced both along the inferior border and also along the median surface approaching the septum. (See Fig. 9.) Here the removal of the lower border only in part rectifies the defect. On the other hand, the removal of the entire turbinal would be obviously excessive. This broad turgidity adjacent to the septum is not easily negotiated by a cutting operation for the reason that you must needs destroy too much mucous membrane and denude too large a surface of bone to secure the result sought. It is in this situation that the writer prefers to remove the lower hypertrophy with the scissors and deal with the hypertrophy adjoining the septum with the aid of the cautery (See Fig. 8), drawing one or at most two linear incisions from behind forward, along the entire length of the swelling.

Hypertrophies of the posterior end of the lower turbinal are most easily removed with the snare. The scissors also can be used in some noses.

The use of the saw in dealing with the inferior turbinate is still a favorite instrument of torture with some, but, like the spoke shave, it is too difficult to control to make it generally popular.

The submucous resection of the inferior turbinal may be

done in those cases where the obstruction is due chiefly to the bony hypertrophy, but it is so rarely that we find such a condition present that the method is seldom applicable.

It is of course exceedingly important in trimming the margin of your turbinal that you make your resection along the entire length of the hypertrophy which usually includes the

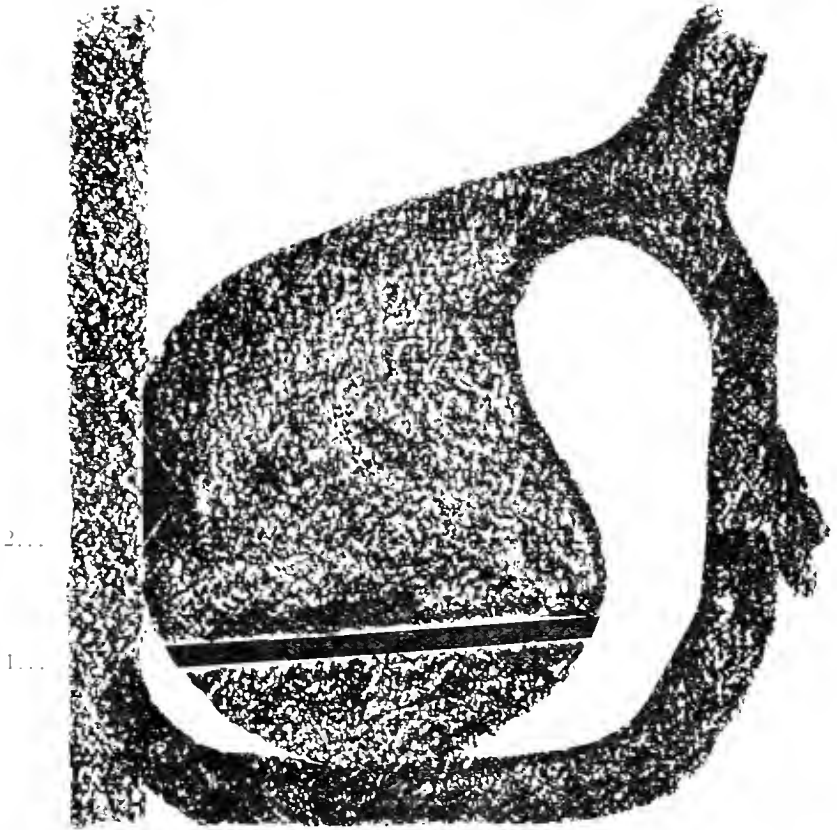


Fig. 8.

Turbinal hypertrophy showing contact with septum and nasal floor. 1—Line of section in removing lower edge of turbinate. 2—Point at which cautery is applied to reduce hypertrophy encroaching upon the septum.

extreme posterior end. (See Fig. 9.) If you remove simply the anterior third, or the anterior two-thirds of the hypertrophy and leave the posterior enlargement, your operation has failed of its purpose and your patient is worse than before. His nose is still obstructed and he has in addition a vicious pocket where the anterior portion of bone was re-



moved, in which pocket mucus is continually collecting and is blown out only with difficulty. The consideration of topical applications and other methods of local treatment have been purposely omitted in order to conserve time.

Any operation on the lower turbinal for nasal obstruction should be preformed with a view to leave the nose in as nearly

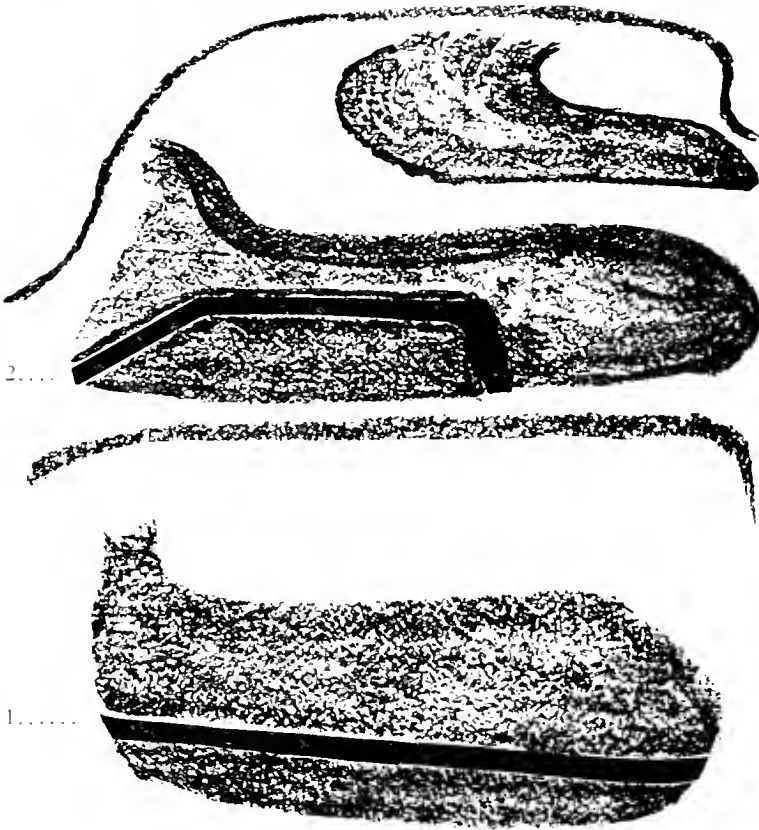


Fig. 9.

- 1—Line of section for removal of inferior edge, where the hypertrophy extends the entire length of the turbinate.
- 2—Faulty technic, removing anterior portion but leaving the posterior hypertrophy intact.

a normal condition as possible, always bearing in mind that it is easier to take out more than to put a little back.

A summary of the evidence shows the inferior turbinate to be entitled to a well defined space in which to carry on his maneuvers. In this space he may shrink and expand at will, always provided that he does not abuse the privilege

to the extent of obstructing the air circulation through the nose, and even such obstruction, if but temporary, may be disregarded. That he is not responsible for any encroachments on the part of his neighbors. That any septum found trespassing on his premises is guilty of a misdemeanor and shall be sentenced to have his bones cut out and to be placed in a straight jacket for a period of time not to exceed twenty-four hours. That when attacked by hay fever he has a perfect right to rise in his own defense, in which case judgment shall be suspended until hostilities have ceased.

An attack of hay fever shall be held to exist if—  
 There's a time in each year when his eyes itch and tear  
     In the good old summer time, and  
 To each pollen-charged breeze he responds with a sneeze  
     In the good old summer time, or if  
 With a hand to the nose he greets each wind that blows,  
     Then that's a very good sign  
 That he's been smelling ragweed  
     In the good old summer time.

#### DISCUSSION

DR. J. G. PARSONS, Sioux Falls, South Dakota: On general principles I think we all agree with Dr. Bailey's prosecution of the criminal, but perhaps not in the manner of his execution. I note that considerable emphasis is laid upon the use of the electrocautery. In turbinals of the intumescent type—that is, those which can be shrunk to approximately normal size—I would like to repeat the recommendation which I made at the Chicago meeting some years ago.

In these cases the bone may or may not be enlarged, but the erectile tissue is markedly so. In reducing these enlargements we wish to avoid the destruction of any more mucosa than is absolutely necessary, and the practice of turbinotomy is quite liable to leave a dry nose. The cautery will destroy the erectile tissue and give a permanent contraction—but at the expense of more or less destruction of mucosa. To avoid this rather disagreeable procedure, I have for some time made use of a submucous cutting operation having for its object the twofold purpose of destroying erectile tissue and of anchoring the submucous scar which forms to the bone. For this purpose I make use of what I call my "bread knife"—a wave edged instrument made by Hardy.

The intumescent turbinal is anesthetized with some nonischemic anesthetic such as alypin; no adrenalin is to be used. The anterior end of the turbinal is wiped off with iodine and the knife is plunged into the erectile tissue as far back as may be desirable. With a sawing movement the erectile tissue is cut up, keeping the blade parallel with the turbinate. The knife is then turned on edge and carried down to the periosteum, which is ripped up thoroughly. On with-

drawal of the knife there is a smart hemorrhage which is controlled by inserting a Simpson tampon which has been smeared with Tr. Benzoin Comp. The swelling of the tampon compresses the turbinal causing the cut up erectile tissue to press tightly against the lacerated periosteum. The tampon is left in for forty-eight hours. On removal it will be found that the scar tissue which forms has become adherent to the periosteum and a permanent contraction of the turbinal results. The only damage to the mucosa is made by the single puncture made with the knife.

This procedure has proven satisfactory in the hands of a number of my friends, and I commend it to you as an efficient substitute for the cautery in cases of intumescent turbinal.

DR. HAROLD M. HAYS, New York City: I am glad the Doctor left the pictures on the wall for they will demonstrate what I wish to say. We all realize that the inferior turbinate is a portion of the anatomy that should be treated as conservatively as possible. It is very important to leave the turbinate alone, particularly in children below the age of puberty or at puberty. I think that in many instances the general physical condition of the patient is to blame for the intumescence of the turbinates and treatment should be directed toward the relief of the general causative factors. If one feels that there is too much turbinate tissue and that some of it ought to be removed, one may resort to a submucous resection of the turbinate. After proper infiltration with cocaine, an incision is made along the free border and the soft tissues separated from the underlying bone. At times, it may be better to fracture the turbinate so that it stands out at right angles. After this dissection, the inferior mucoperiosteum, with or without the bone, is excised and the remaining tissues folded over to make a new turbinate. This operation is eminently satisfactory and leaves a good, healthy surface.

DR. ROBERT SONNENSCHN, Chicago: I would like to mention two points: First, in relation to the Doctor's operation, which I think is most excellent, and another which is even simpler and is used by Dr. Pierce. He passes a probe under the periosteum, forward and backward, and gets a reaction which causes an agglutination of the tissue, in the same way that the Parson's knife is used.

The other point in regarding the fracture of the turbinate as depicted on the second, third and fourth diagrams. I have used the simple procedure of infracturing the turbinate by means of a plain spatula elevator, and pushing it against the lateral wall of the nose. In many cases you can in this way gain an opening which is very effective, and which is not accompanied by any loss of valuable tissue.

DR. R. P. SCHOLZ, St. Louis, Mo.: In commenting on Dr. Bailey's very interesting paper, I wish only to congratulate him on the very excellent way he handled the subject. If I am permitted, I will briefly describe a submucous cauterization of the inferior turbinate which I think was first described by Dr. Williminsky, and which I used for a number of years, then discarded and have recently taken to using again. A tiny vertical button-hole incision is made over the anterior end of the turbinate to be cauterized. Through this a slender scalpel is introduced and worked back into the submucous tissue about as

far as the cauterization is to extend. The scalpel is next replaced by an unheated cautery. The cautery should be slightly curved, so as in a way to conform to the contour of the turbinate from before backward, or along the length of the turbinate. After the current is applied, and the cautery begins to sear, slight rotation of the instrument will, because of the curve of the cautery, permit quite a wide cauterization at the posterior end of the inferior turbinate, which would not be possible when working with a straight instrument. A sweeping motion with the instrument upward or downward, will increase its scope in both directions. Thus practically the entire turbinal surface can be cauterized submucously. To the skeptical the question would arise, what becomes of the charred tissue which remains in the pocket after the cautery is removed? While I cannot answer this question definitely, I am of the opinion that the carbon etc., thus created, becomes imbedded in the tissue when healing takes place. According to my observation all these wounds heal and heal with but little or no reaction and without suppuration.

DR. OTIS ORENDORFF, Cañon City, Colo.: I feel that I have a sort of a stepchild that has been abducted. Ten or twelve years ago I invented an electric cautery on the bread knife principle for this purpose and published it in the Journal of the American Medical Association. I then left off using it and have recently taken it up again and am gratified to find that others have also taken it up. The cautery knife is very simple, like this with a serrated edge (indicating on blackboard), installed here (indicating) and used very similarly to a bread knife. Say this is a turbinate, (indicating) and if introduced in this manner with a sawing motion, an incision is made directly to the bone, and then by sawing back and forth and at the same time turnings the edge from side to side this is widened, if you like, in a fan-shape, and all that is left when the instrument is withdrawn is a little wound along the lower edge, which serves to give drainage.

DR. J. F. BARNHILL, Indianapolis, Ind.: I do not wish to let this opportunity pass without stating my belief that the sensible use of the electrocautery in such cases as have been described in this paper has never yet hurt any nose.

## SOME NEW POINTS IN THE SUBMUCOUS RESECTION OF THE NASAL SEPTUM—LANTERN DEMONSTRATION

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MINNEAPOLIS

A submucous resection should be performed on the nasal septum for the following reasons.

First. To restore normal function by making the air currents passing through both sides of the nose as nearly equal as possible, thereby getting the utmost use of all the turbinates.

Second. To restore to normal the direction of the air currents by having it follow the normal curve around the anterior end of the middle turbinates.

Third. To restore to normal the drainage and aeration of the cells above.

Fourth. To restore to normal the ventilation of the ears through the nose and Eustachian tubes.

As the turbinates are the protectors of our lungs by warming, and moistening the air, and sifting out the dirt, it is essential that the air currents should be as equal as possible through both sides of the nose if we are to get the utmost use of the turbinates.

If we restore the normal curve of the air current around the middle turbinates, we give the patient an easy breathing nose.

If we are to avoid or correct trouble in the cells in the upper part of the nose, they must have drainage and aeration.

Nearly all catarrhal deaf cases are due to occlusions in the nose, which cause occlusion or partial occlusion of the Eustachian tubes.

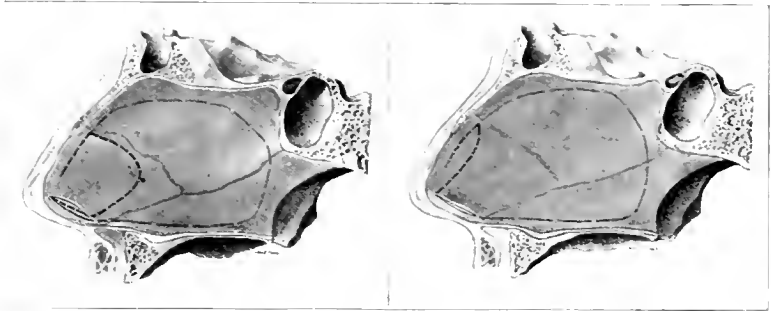
Considering these points we find that a deflected septum is not alone always to blame, but an apparently straight septum may be so thick between the middle turbinates as to cause all the trouble.

A complete submucous should be performed in every case; by that I mean not only the cartilage, but the thick cartilage and bone between the middle turbinates as well as the crest should be removed.

It is not necessary for me to describe the technic of a sub-

mucous resection, but I wish to call your attention to several points which so far as I have been able to find out are either new or have never been reported.

In some cases the deflection in the cartilage extends nearly to the upper limit of the nose. If this is left a tenting of the mucous membrane above is the result; if it is removed the bridge "drops."



A

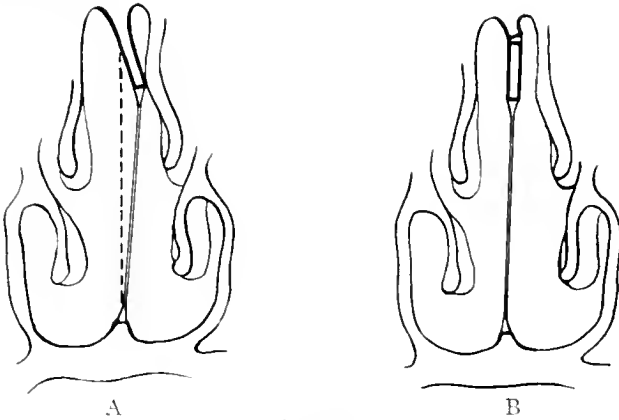
Fig. 1

B

A. Shows largest piece of cartilage left.

B. Shows smallest piece of cartilage left.

The dotted line above shows cut in cartilage if necessary to make it hang straight.



A

Fig. 2

B

A. Shows tenting when cartilage is left.

B. Shows cartilage when cut.

To prevent this "dropping" and give more support, in making the cut with the Ballenger swivel knife, I start as far down the cartilage as I can; going inward and upward with a half curve leaving as large a piece as possible. The thickness of the carti-

lage and the amount of deflection in it determines the size of the piece.

In the cases where this makes a tent, I start in the deeper part of the nose and cut this piece of cartilage towards the tip of the nose until it hangs straight, never entirely cutting it off. This heals between the flaps and leaves a wide piece of cartilage

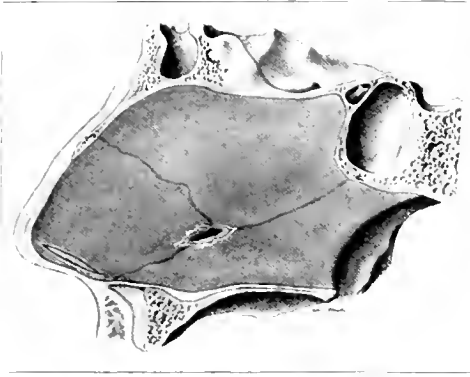


Fig. 3  
Perforation in septum

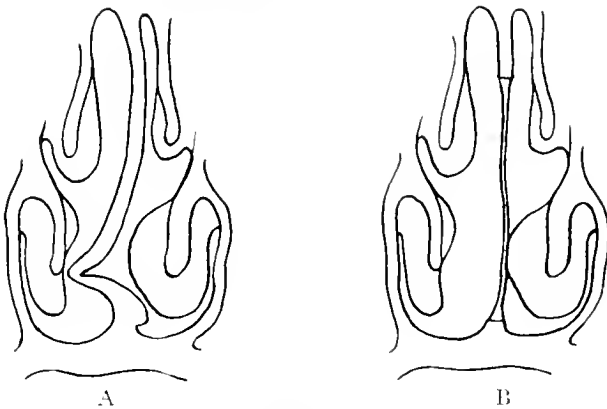


Fig. 4

- A. Shows sharp angular deflection.  
B. Septum against turbinate.

where support is most needed. It also helps to prevent flapping when the nose is blown.

To prevent infection a 1/5000 bichlorid solution is swabbed between and outside the flaps and around the turbinates. The flap is sutured. Plates of dental wax as wide as possible are then placed on each side of the septum to support the membrane, the

packing outside of these. The packing is removed the next day after the operation and the wax the following day.

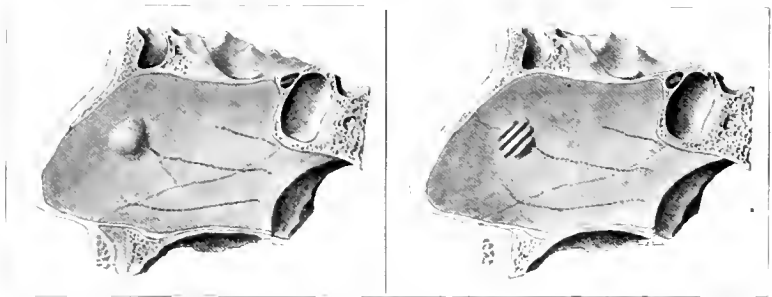
It has been my practice in all cases where the mucous membrane has been torn and in cases where the membrane is thin from ulcerations, to smear these places with an ointment of scarlet red. Somehow, they seem to heal nicer under this treatment.

Nearly all of the perforations during a submucous resection are due to sharp angular spurs, which occur most frequently at the upper end of the crest. If this occurs opposite the lower turbinate, and you are unable to close by the flap method, scarify the larger turbinate opposite the tear and pack the septum over against it.

A plate of dental wax is placed against the septum on the opposite side, the packing outside of this; you are thus able to change the packing every other day without disturbing the wound.

In about a week, it will become adherent, and as soon as the adhesion is firm, a piece of the mucous membrane of the turbinate is cut out, closing the hole.

In cases of old perforations following a submucous resection, the technic is the same except you must also scarify the edges of the hole, and, if necessary, the turbinate can be partially detached and brought out to meet the septum.



A

B

Fig. 5

A Shows Pynchon's hypertrophy.

B Cautery marks in hypertrophy

About a month or two after the operation, if the patient is still unable to breathe easily, I have found that the soft hypertrophies on the septum just in front of the middle turbinates mentioned by Dr. Pynchon years ago were to blame. If these are deeply cauterized, a roomy nose is the result as soon as the burn heals.



## DISCUSSION

DR. THOS. E. CARMODY, Denver, Colo.: I have very little to say except in commendation of this paper, as Dr. Pratt has covered the question very thoroughly. I think he was going to say something more about the anesthetic. In regard to Dr. Painter's paper, I have used this method which was taught me by Dr. J. A. Pratt, but instead of using cocain I use apothecin, which I think our Committee on Local Anesthesia has said we never have any deaths from, and I have never seen any bad results. I leave the paste in for fifteen or twenty minutes. Possibly cocain may have a more rapid effect. Dr. Pratt uses the bichlorid on the flaps after operation, but I do not use it although it may be good. I have used the dental wax he speaks of but have now discarded it; it is good, however, in many cases. The Scarlet R helps in many instances in stimulating the formation of granulation tissue. Dr. Pratt showed us the intumescence which we have and the cauterization for reducing that is probably of a good deal of value. I suggested to him in talking about it that it may be better to use submucous cauterization, but we must be careful not to interfere with the flap on the opposite side.

DR. F. W. BRIGGS, Fargo, North Dakota: My presumption in discussing this paper of Dr. Pratt's is because I have witnessed a number of submucous operations performed by him and have followed the same technic a number of times in my own practice, with very gratifying results to myself and patient. The technic which is not difficult, when once mastered, does not complicate or prolong the time consumed. Conservation of a large part of the triangular cartilage is of distinct advantage to the patient, preventing flapping of the septum and leaves intact the anatomic support of the end of the nose.

DR. C. W. HAWLEY, Chicago: Seeing this submucous resection illustrated, I wish to speak of a little accident I have had, as a caution. About two weeks ago I did a submucous resection on a very large man, with a very large throat. I have always used the dental form of splint. I removed the packing Saturday morning, and the patient was all right, but on Saturday night, he had a severe pain in the throat and kept on swallowing to relieve the pain, and on Monday the patient said "You will not have to remove the splint on the right side." He had swallowed it. We had a roentgenogram taken, but the splint had already passed beyond the stomach and had passed to some region here lower down. I do not think he is still holding it. I think after this I will tie all my splints to the cheek with adhesive.

DR. AUSTIN A. HAYDEN, Chicago: The submucous resection is always of interest. The operation of reforming, it seems to me, can be taken care of very satisfactorily by the reimplantation of some of the cartilage after it has been removed. I have been doing this routinely for some time with much satisfaction. We find that also stabilizes the new septum and prevents flapping. The possible objection that I see to Dr. Pratt's procedure is that unless the septum he leaves in front is perfectly straight a deformity will result after the submucous operation has been performed.

As to secondary cauterization of the points, as Dr. Pyncheon used

to do, I must say I do not see those hypertrophies after the submucous operation.

As to the drooping of the nose, I believe as substantial a bridge is left by leaving the arc in place as by the procedure of Dr. Pratt.

We like sterile vaseline in place of the wax which Dr. Pratt suggested, anointing the tampons with the vaseline.

As to the anesthetic which is most desirable, I believe nothing is as good as the cocain mud, suggested by Dr. Freer a good many years ago, and mentioned here this afternoon.

DR. JOSEPH C. BECK, Chicago: I wish to say a few encouraging words to the doctor about going on and doing this work. I have tried to close large perforations which had existed before I had seen the patients and I am now working on a case that I have had for seven years and performed twice as many operations and the perforation is as large as ever. With a perforation that has existed for a long time, it is almost impossible to close it by any means that I have tried. I think it is a waste of time and energy to attempt it.

DR. HAROLD M. HAYS, New York City: There are only two points I wish to mention. First I wish to indorse what has been said about properly sterilizing the tissues at the time of operation. A number of years ago, I was unfortunate enough to get a severe infection between the flaps with a resultant septicemia. Since that time I have made it a rule to apply tinctur of iodine to the entire mucosa of the septum before operating. The iodine never injures the tissues severely. At the end of a few days, one will note that the superficial epithelium has peeled off, leaving a fresh, new surface. It is far more important to try to sterilize the parts that are being traumatized by the operation than to clean the outside of the nose and face.

The second point I wish to make is that it is absolutely unnecessary to pack the nose after a submucous resection. The more operations on the septum I do, the less packing I use. A small strip of gauze may be used in the floor of the nose to hold the edges of the incision together. If this procedure is resorted to, suture of the flap is not necessary. In fact I think it better not to suture, because a closed incision is liable to lead to retention of blood clots or infected material. Incidentally, I may remark that I consider a submucous operation a hospital operation. The reason I am able to get along without packing, I think, is because all my patients remain in the hospital over night and receive constant attention and rest.

DR. JOHN F. BARNHILL, Indianapolis, Ind.: I wish to know how the flaps become nonsterile. The gentleman spoke of sterilizing the flaps before closing. I had the idea that the exterior of the flaps was sterile before operation.

DR. A. H. ANDREWS, Chicago: In regard to not packing the nose, I think if there is no packing you would better make a long incision—as far back as to the septum.

DR. FRED J. PRATT, Minneapolis, Minn. (closing discussion): About the bichlorid, we have had some cases in which we have found a membrane on the turbinates and on the septum. I guess everybody has seen it, and so we use a 1/5000 bichlorid solution, the same as is used

in cleaning an eye for a cataract operation. There is no reason for swabbing the inside, but I just do it as a precaution and I am very careful to see that every bit is dried out.

As to wax, I always use as large a piece as I can get into the nose and as soon as it becomes warm from the heat of the body, it conforms to the septum. If anyone should swallow it, it would do no harm because it is very soft.

About putting back a piece of cartilage to close a perforation, it will be absorbed if it is left bare. The size of the piece of cartilage I leave depends upon the curve and thickness. I am sure if the doctor will see that the cartilage and bone in the septum is out between the middle turbinates, in ethmoidal troubles it will not be necessary to take the cartilage out in front if it is straight. We heard a paper yesterday about headaches that are relieved by taking the pressure off the ethmoids and middle turbinates by removing the cartilage and bone in this region.

As to closing these holes in the septum, you cannot close a large hole. I reoperated the septum of one of the doctors who is here, who had a perforation and it was closed by the turbinate growing into it. The idea occurred to me from this case.

As to packing the nose, I never have had quite enough nerve to let my patient go without packing. They do bleed, and I am afraid also of a large blood clot between the flaps.

## THE DIAGNOSIS AND TREATMENT OF MAXILLARY SINUSITIS

HOWARD V. DUTROW, M. D.  
DAYTON, OHIO

I wish to ask your indulgence of this paper, only for the reason that I feel that I have been able in the course of my work to make some important, if not altogether new observations in the diagnosis and treatment of maxillary sinusitis.

Infection of the nasal accessory sinuses, both acute and chronic, have become very important and far reaching in their relationship to the everyday practice of medicine. The maxillary sinus on account of its peculiar anatomic construction and its close proximity to the teeth makes it the most frequent offender. The dental profession has been aroused from its lethargy and is now most active in the recognition of pathology in the antrum of Highmore.

*Incidence of Infection:* The incidence of infection has become very high during the last two years, due in part to the great epidemic of influenza, and the two or three succeeding milder epidemics which predisposed to infection of the nasal accessory sinuses. A great many infections can be traced directly to the recent activity of the so-called exodontists and dentists in general in extracting teeth. They not only discover a great many old infected antra, but they also cause new infections by opening the antrum in a great many cases without knowing it, thereby creating a direct communication with the mouth, through which food and infectious organisms enter, while some out of curiosity probe into the antrum without first taking the necessary aseptic precautions. Another great cause for the increase in the recognition of infected nasal accessory sinuses is to be found in the education of the laity as to the desirability of a general physical examination. During the course of this examination the patient usually passes through the office of a nose and throat man who should not consider his work complete without at least a thorough transillumination of the sinuses, confirmed by an X-ray picture. Then, too, there is the increasing knowledge of the medical and dental professions at large of the ever present possibility of the existence of foci of infection, and the great benefit to the patient by their prompt removal. This I believe to be

the great incentive governing physicians and dentists in their desire to ferret out the underlying cause in working out a diagnosis in obscure cases of so-called rheumatism, organic heart disease, nephritis, neuritis, etc.

*Diagnosis:* The diagnosis of maxillary sinusitis is not always easy. It is very often in the obscure cases that we find the greatest amount of absorption of toxins taking place. It is very easy to diagnose a case which comes to us with one or both nostrils filled with pus and with or both antra dark on transillumination, which in turn is confirmed by the skiagraph. The class of cases which very often tax our ability in diagnosis is the one which comes to us in the terminal stage of infection, the acute infection having taken place years before, without recognition. At that time the mucous membrane is thoroughly infected and doubtless pus was present in large amount and made its escape through the ostium, and the patient and his physician regarded it as a "cold" in the nose which would clear up in time. In a great many cases they do apparently clear up so far as the objective symptoms are concerned. The discharge ceases and the patient is as far as he can tell, free from his infection, but by this time a great change has taken place in the mucous membrane. It has become more or less degenerated and we have a varying quantity of granulation tissue which is constantly secreting a mucoid substance of changing consistency. What is still more important from the patient's standpoint in the way of sure and permanent relief is the fact, as pointed out by Dr. Beck before this Academy a year or two ago, that we have the original infection still present, though in an attenuated or less virulent form in the mucous membrane, and submucosa, and in the space between the mucous membrane and the periosteum. The patients are referred to the rhinologist by their physicians because they have made a most thorough examination and were unable to find any cause for their complaint. These cases require a most careful history as to previous nasal infection or discharge and especially of their dental work, because it is my belief that fully from 65% to 70% of infections of the antrum can be traced directly to a root abscess. At the time of our rhinoscopic examination we are very often unable to detect any free pus in the nose, but there is present a heavy viscid mucus in the middle meatus, which finds its way into the postnasal space and can be seen in the form of a string or band on the posterior naso-pharyngeal wall. Upon transillumination we will get a slight diminution in the illumination on the affected side and the pupil of the cor-

responding side will be dark. This is at once suggestive of pathology within the antrum and should be confirmed by X-ray.

It has been my experience that the X-ray findings have been consistent and with but one exception have confirmed the transillumination. In this case the skiagraph was taken first and showed definitely pathology in the right maxillary sinus. The history in this case was positive and the infection was of long standing and the patient had been operated upon four times, but the Freer-Jackson transillumination failed to indicate the slightest shadow. Both pupils transilluminated perfectly. There was a thick mucoid discharge in the nose and symptoms of anemia and general malaise. This case was especially interesting to me because the X-ray findings were positive and those of the transilluminator were negative. I think the explanation is to be found in the fact that the X-ray is far more sensitive to the diseased mucosa and submucosa, while these structures offer little resistance to the passage of the light of the transilluminator. I have laid considerable stress upon this class of cases because they are not infrequent and are highly pathologic in character, and are the ones that are most likely to go undiagnosed. The various other methods of diagnosis are familiar to us all and need not be mentioned here. However, in passing, I wish to condemn the promiscuous use of the trocar and irrigation as a diagnostic routine.

This procedure is not without danger to the patient as reported by Redair Gording of Kristiania, Norway, in his excellent article entitled "Serious Complications in the Puncture of the Maxillary Sinus," in which he reviews nine cases found in the literature with a fatal issue in four, and seven cases collected by himself with two fatalities.

I cannot see why we should subject our patients to this added risk when the findings are of so little value. If we have an antrum full of pus we know it positively by other means of diagnosis, and since the puncture and irrigation can only confirm what we already know, why should we use it? On the other hand if the antrum is without pus but filled with diseased mucous membrane and masses of granulating tissue our irrigation will be returned practically clear and we have gained nothing. The puncture and irrigation to my mind is devoid of any curative value whatever. The X-ray must then necessarily be our sheet anchor in the diagnosis of these obscure cases of maxillary sinusitis. It is necessary to have the services of a good radiologist

and we must learn to read and study the skiagraph with him in order to arrive at an intelligent and scientific conclusion.

*Advantages of the Caldwell-Luc Operation:* Both of these operators described independently a similar procedure, Caldwell in New York in 1893, and Luc in France in 1897. After ten years experience and observation of the various surgical procedures for the radical cure of maxillary sinusitis, I have been led to conclude that the Caldwell-Luc operation offers the greatest advantages. I need not burden you with the technic of this operation, but suffice it to say that it gives us a direct approach to the antrum through the canine fossa. The bone here is thin and can easily be drilled through with a Hartmann drill and the opening enlarged sufficiently to give us an excellent view of the interior of the antrum and all of its ramifications. This exposure to my mind is most important. Most of us at one time or another have attempted to work through too small an opening. I have heard the Caldwell-Luc operation unfavorably criticised in comparison with the Denker operation. I think you will agree with me that the Denker is rather radical in character and the destruction of bone unwarranted. Some have said that unless you did a Denker operation you were likely to leave pathologic tissue in the angle of the sinus just behind its anterior wall. In doing the Caldwell-Luc operation I have not found the slightest difficulty in cleaning out this angle with a small and properly curved curet. The ostium can be thoroughly inspected and the orifice curetted free from any polypi or granulations that are almost always present in varying amounts. In doing this operation every vestige of pathology should be removed from the sinus. There is one location in particular where I have seldom failed to find a large amount of granulating tissue and that is that portion of the sinus corresponding to the concave inner surface of the malar bone. The opening into the inferior nasal fossa can be made as large as it is deemed necessary, by carefully chiselling away the thin bone without perforating the nasal mucosa and without injury to the inferior turbinate.

Take plenty of time to perform the operation. Be thorough and accurate in every detail. Unless you do this you will surely have to operate many of these cases a second or third time. Do not subject your patient to the possibility of a subsequent operation in order to save a few minutes on the operating table. It behooves all of us as rhinologists to be conservative whenever possible in our nasal surgery. Lo! the thousands, yea, the millions of turbinates that have been sacrificed in years gone by.

You will find that it is rarely if ever necessary to remove any of the turbinate if your nasal opening is low down and on a level if possible with the floor of the antrum and of the nasal fossa, and with its long diameter antero-posteriorly.

Doubtless all of you have seen cases in which the middle turbinate together with the ethmoid labyrinths had been removed, where a really widely destructive operation had been done for the cure of what seemed to be an ethmoiditis, which later proved to be an error in diagnosis and what really was a maxillary sinusitis. I have seen case after case, of what to the casual observer seemed to be an ethmoiditis clear up immediately following a radical operation upon the maxillary sinus. I think you will agree with me when I state that the order in point of frequency of infections of the nasal accessory sinuses is as follows; first maxillary, second frontal, third ethmoid, and fourth sphenoid. I shall feel that I have been justified in presenting this paper if for no other reason than to impress upon your minds the importance of eliminating all possibility of an infected maxillary or frontal sinus, before you sacrifice the middle turbinate and the anterior and posterior ethmoid cells. In doing an operation upon a sinus nothing has been destroyed, nothing has been removed that has a physiologic function to perform. The nose has a definite function to perform and when its structures are removed they cannot be replaced. Thorough ventilation and complete gravity drainage are great factors in the satisfactory surgical treatment of infected antra. The normal ostium is one of those freaks of nature wrought in the process of evolution which was in its proper relationship to the floor of the antrum when we walked on all fours but became malposed when we assumed the upright position.

*Postoperative Treatment:* The aftertreatment of the radical maxillary sinus operation consists of the immediate aftertreatment and the treatment during convalescence. It is my practice to close the canine fossa opening by suturing the mucous membrane with catgut, and as a rule this operative wound needs no further attention except ordinary mouth cleanliness. I remove the packing through the nostril in from 36 to 48 hours. In putting in the packing a little care not to pack too tightly and to start the folds at the bottom of the sinus so that the layers come forward to the nasal opening will facilitate removal and be least uncomfortable for the patient. Edema of the face and soft tissues about the eye on the operated side varies in different patients and with the pathology present in the sinus. I have never



seen it of serious consequence, though it occasionally is very annoying to the patient. The edema lasts from one to three weeks and cold applications are the only treatment necessary. There seems to be some difference of opinion as to the advisability of irrigating the sinus subsequent to operation. It is my practice never to do so unless there is special indication, such as unusually profuse and foul discharge. In thirty-seven cases, irrigation was used only twice. In the first case there was a marked and prolonged reaction in the cheek lasting about ten days, when the sinus was irrigated to determine whether or not any pus had accumulated from the periostitis. The irrigation was returned clear and was not used again. The second case was a virulent staphylococcic empyema where the dentist some months previous had forced the root of a tooth up into the sinus. There was a small area of necrosis of the alveolar process from which came a foul discharge through the nasal opening. This case was irrigated every day or two for four or five irrigations when the odor disappeared and the discharge ceased. I do not believe in waterlogging the lining of the sinus. Another objection to repeated irrigation is the ever present possibility of re-infection. In most cases the only local treatment after the removal of the packing is the daily cleansing of the nostril and inspection of the nasal opening into the sinus to insure its patulency. The mucous or muco-serous discharge which is rather profuse for a few days gradually lessens and the nostril is dry in about ten days.

It has been my good fortune not to have had the serious ocular and brain complications of abscess mentioned by some authors, nor have I had bony necrosis of the sinus walls. The end results of a properly performed maxillary sinus operation are most gratifying when one notes the immediate improvement of the local point of infection and the general condition of the patient. Within a few weeks the patient loses the pasty, sickly, septic appearance, energy is much improved, weight gained, and color and appetite back to normal.

*Conclusions:* 1. That the incidence of infection is, for the reasons stated, greater than supposed and that physicians and dentists generally are recognizing the existence of latent infected antra more and more each day.

2. That many infected antra go undiagnosed because of the absence of subjective symptoms. That the trocar and irrigation is very limited as an aid in diagnosis, is not without danger, is without curative value and is misleading.

3. That the Caldwell-Luc operation offers the most perfect permanent result if carefully done, with the minimum sacrifice of normal structures.

4. That postoperative irrigation should be used only when definitely indicated and not as a routine.

#### DISCUSSION

DR. JOHN F. BARNHILL, Indianapolis, Ind.: This paper is interesting because of the frequency of sinus disease. In the main, I agree with the points the speaker has made. The first was as to the cause of antrum infection. The essayist stated that he believes 60 to 70 per cent are due to the teeth. I have had rather a different experience. My view has changed somewhat since the Roentgen-ray has been used in the examination of the teeth, but still I am of the opinion that 60 to 75 per cent of antral infections enter through the nose. As the essayist has said, frequently disease of the antrum is not easy to diagnose, and yet any well trained rhinologist should seldom, if ever, fail to make a correct diagnosis, considering his present means of doing so. The patients usually state that they have a persistent discharge, usually from one side of the nose. They often give a history of cold in the head preceding this. Then there is the appearance of the patient himself; he usually has a septic look, suggestive of infection. Others have headache and others symptoms which, added to those stated above, give strong presumptive evidence of sinus involvement. Moreover in the nose we may see pus, or masses of mucus, all pointing to the disease in question. Formerly, more than now, I have frequently used a means of diagnosis that the essayist condemns—puncture by trocar and washing out the antrum. I never fear to use this diagnostic aid, and especially in poor patients, I thus save them the cost of an X-ray examination. I have yet to see a death, or even dangerous symptoms following the use of this valuable diagnostic measure.

I depend, however, upon the roentgenogram more and more and when the X-ray findings are taken, together with the results of my personal examination of the case, I feel certain of a correct diagnosis.

The best method of treatment is, of course, the chief end to be sought, and I fully agree with most that the doctor has said regard his plan. He does not divide his patients into acute, subacute and chronic, but I take it that he is discussing the chronic cases only. There are many who still believe that the window resection is satisfactory in many of these cases, but I think any plan uncertain of results until we first find out what the exact pathologic condition of the antrum is, before we decide what the form of treatment must be. If the floor of the antrum sags to a lower level than the floor of the nose and we have reason to believe that the antrum is filled with polypoid mucus membrane, that would be a case in which I think it would be foolish to depend upon improved drainage, which is all window resection means. In such a case a radical antrum operation is absolutely necessary, should be done thoroughly, and upon proven surgical principles. Therefore, we must first remove all disease from

the antrum and then provide for drainage until the antrum is healed. In doing this the antrum must be opened wide enough to enable the operator to see every nook and corner of the cavity, and the surgeon must not be satisfied until he is sure that all of the diseased tissue is removed.

I do not close the wounds after operation; I do not pack them. I am sometimes guilty of washing them out afterwards, but have seen no reason to be sorry for doing so.

DR. J. A. DOXOVAN, Butte, Mont.: Two of my most annoying antrum cases, which never showed pus, and resisted all treatment for a long time, were immediately relieved and got well by making a large opening in the antrum. For years I opened antrums low down, but abandoned it for the easier operation above the lower turbinate. This failing in so many chronic cases, I returned to the lower opening again. I had made a 7 mm. trephine on a heavy substantial shank, total length of instrument 15 cm., to fit a quarter horse power surgical engine. After giving the patient a quarter of a grain of morphin, and thoroughly anesthetizing the area beneath the lower turbinate, I insert the trephine beneath it, allowing it to cut a semi-circular opening through the edge of the turbinate, if there is not room otherwise, and reinsert behind this opening, enlarging the opening with a burr. The operation is completed in a few seconds' time.

DR. H. B. LEMERE, Omaha, Neb.: At the last meeting of this academy, I had the pleasure of presenting a paper on this subject and I wish to most heartily endorse what Dr. Dutrow has said with two exceptions.

In regard to the dental origin of maxillitis, Drs. L. W. Dean, Davis and Oppenheim have called our attention to the fact that antrum disease is not infrequent in children, and that the condition often does not clear up after removal of the tonsils and adenoids. There must, therefore, be a number of children who carry to adult life antrums which are the seat of chronic infection to varying degrees, and I think this is the origin of many chronic low grade antrum infections in the adult. The etiology of these cases of maxillitis in children is usually unresolved colds, or the nasal infections of the acute exanthemata, and has no connection with dental pathology.

Dr. Eggers of the Department of Pathology, of the University of Nebraska, examined twenty-three specimens obtained by me from the facial and nasal walls of a series of cases of maxillitis. Seventeen of these specimens showed microscopically an osteoporosis. This agreed with my operative findings.

It is not surprising therefore, that the nutrition of the teeth in such diseased bone should be interfered with, and the diseased teeth are the result and not the cause of antrum involvement.

Dr. Caldwell's original communication on his operation is radically different from Dr. Luc's description. Caldwell does not advocate radical curettement of the antrum lining—Luc does. Caldwell makes his nasal opening under the inferior turbinate; Luc takes down most of the nasal wall.

DR. GEORGE W. BOOT, Chicago: I wish to disagree as thoroughly as possible with two statements: First, as to the reliability of the roentgenographic report. I am sure that many reports I have had have been absolutely wrong. The second point is that in my opinion it is not necessary to curet out every vestige of the mucosa. The mucosa has a wonderful power returning to a normal condition if good drainage is provided.

DR. JOHN A. PRATT, Minneapolis, Minn.: I wish to mention just two points: About the cause of the pus in the antrum, in dispensary work, I find that the antrum is more of a reservoir, that we get anterior ethmoid or the frontal disease in about 75 per cent of the cases. If attention is called to this you will find the same thing. We make a fairly large opening and wash out the antrum. After that we use suction in treating these cases, and you will be surprised to find how quickly they will clear up by using suction.

DR. AUSTIN A. HAYDEN, Chicago: I was just going to say something about suction and Dr. Pratt took the words out of my mouth. The blowing of the nose in the antrum cases, in an effort to expel the pus, reinfects not only the nose but the other passages. Therefore, instead of blowing it out through the nose it should be blown back and expectorated through the mouth. This helps these cases to get well.

I think most cases come from an acute rhinitis and are not of dental origin. I believe the roentgenographic findings are frequently not definite, but they are of much assistance. Occasionally, perhaps, where the sinus is large and the outline not particularly definite, the barium injection of the sinus recommended by Dr. Cavanaugh last year may be of service.

I believe the Caldwell-Luc operation in the main offers the best opportunity for cure in these cases.

DR. W. S. TOMLIN, Indianapolis, Ind.: I think the essayist in the stand he has taken with every one of these cases shows that he has not had the experience of being operated upon himself. Also, that perhaps he has not had persons who were near and dear to him, members of his own family, in the same position, because persons who have these antra radically operated do usually get well of the antrum suppuration for the time being, but are most frequently subject to reinfections every time they take a trip on the train or a long, dusty automobile ride, and always have a long and critical time after the operation which leaves the antrum open to the lumen of the nose. Many of these cases which are subjected to puncture and irrigation do make satisfactory recovery, and I think every patient in whom it has not been demonstrated beforehand that his antrum is full of polyps should be given the chance. If this does not result in proper healing look well to the ethmoid, for probably it is being very frequently reinfecting from the ethmoid region.

DR. THOS. E. CARMONY, Denver, Colo.: Just a word about the dental and nasal origin in these cases. I wrote a paper in 1908 in which I stated that the dental origin was about 33 per cent, and from my training I think I was able to investigate them pretty well. If you

will examine the teeth very carefully you will find that the dental origin will decrease. I believe it is not more than 35 per cent.

As to transillumination and the Roentgen-ray, I consider transillumination better than the Roentgen-ray. In the acute case, unless the antrum is full of pus, you do not have the Roentgen-ray interfered with, but have simply a little thickening of the membrane. If there is an acute inflammation of the mandible, the Roentgen-ray will penetrate that and the results are not satisfactory.

About the puncture, I believe with Dr. Barnhill that almost any operation we do will result at times in death. I believe this article of Gording's does not eliminate, in at least two of the cases, the anesthetic. I think death may have been due to the anesthetic and not to the puncture.

As to the air embolus, that may be. Some of the cases I have punctured and apparently cured may have gone to somebody else, but I have had several cured.

DR. A. H. ANDREWS, Chicago: I want the statement that such a large percentage of these cases are of dental origin to be challenged emphatically. I doubt if there is over 10 per cent. I am so accustomed to having patients with absolutely perfect teeth develop antrum of Highmore disease, that I think the dental origin is very small. I also think the wholesale condemnation of transillumination is not justified. I have seen many men use it and not use it right and get bad results. If you are going to use intense transillumination you must control the ray of light. If you put on a hood you will get good and reliable results. The best hood I have found is a black cloth slipped down over the tube. If we want much light slip it further over and if not so much pull it back a little. You must have just the right amount of light. If there is too little there is not enough illumination, and if too much there is not the proper shadow.

I wish also to protest against the wholesale currettement of the mucous membrane lining this cavity. In going from the inferior meatus up to the antrum we are liable to pus up the antrum and not get into it at all.

I think the greatest number of deaths have been caused by putting air into this cavity and having it go where you do not wish it to go.

DR. L. K. GUGGENHEIM, St. Louis, Mo.: Almost everything has been covered so I have very little to add. I wish to say that puncture does cure some cases; namely, practically all of the acute cases and many of the subacute ones.

I believe a large opening made through the nose into the antrum accomplishes the thing that is most necessary in chronic cases and that is drainage and ventilation. Pathology does disappear in many of these cases as a result of drainage and ventilation alone. Many years ago I performed the Caldwell-Luc operation frequently, but I do very few of them now. In a recent article by Rider Gording, it has been shown that the cases we thought were cocaine poisoning after puncture were really cases of air embolism or possibly a reflex phenomenon. I think we should take this problem seriously and try to understand how to prevent such accidents. Gording says that where there

is difficulty in pushing the needle through a thick wall, there is danger of separating the mucosa of the antrum from the bone and thereby causing an air embolus. He advocates the use of a small drill in such cases. I have had one case of the kind I thought would end fatally, but fortunately the patient recovered.

DR. W. E. BROWN, Pittsburgh, Penn.: I think it is well to bear in mind that not all of these cases recover even after the Caldwell-Luc operation. I wish to report a case that I had last summer in which I did the Caldwell-Luc operation. The antrum was full of pus and polyps and the man, in addition to the local symptoms, had a very severe arthritis which involved the ankle, knee and wrist joints, accompanied by swelling, inflammation and a temperature of 101 degrees to 102 degrees Fahrenheit. I did a Caldwell-Luc operation but the patient, although he improved and the joint symptoms subsided, did not get well. I decided to have an autogenous vaccine made. Examination showed the infection to be due to streptococcus, staphylococcus and influenza bacillus. He had had influenza the year before. I used the vaccine in connection with the other treatment and the man got entirely well of the sinus and joint conditions.

DR. W. M. C. BRYAN, St. Louis, Mo.: I just want to say a word for conservatism. I had the misfortune, and good fortune also, to have a bilateral antrum puncture and lavage on myself last spring; as a result of this experience I would suggest that the preliminary shrinking of the middle meatus be very thorough. In the one side it was well shrunk and there was no pain, but in the second side where a little blocking occurred, the pressure within the antrum was extremely painful.

About the Caldwell-Luc operation, we must admit that it will sometimes be necessary but not often. As several of the speakers have said, drainage is the thing, and a good sized opening underneath the turbinate without its destruction will accomplish that purpose. I had a talk with Dr. Sluder about this a short time ago, and he said he had never found a case that could not be cured by a window opening underneath the inferior turbinate.

DR. CHAS. D. THOMAS, Peoria, Ill.: My only justification for talking on this subject, when time is so short, is that I have had this disease. I had antrum trouble in my boyhood, about forty years ago. It passed away or remained dormant for a time and then reappeared following the influenza. I find it is not so easy to diagnose an antrum trouble as the books would have us believe and the essayist indicates. The symptoms as found in the nose vary enormously. In trying to find and demonstrate a little pus underneath the middle turbinate, it is not always possible, as I think you all have found out many times. That symptom in my experience has never been at all constant and reliable. The reliable symptom, I think, in the acute trouble is that as the patient walks across the floor he has a throb of heavy pain in the antrum. In the chronic cases when he stoops over he has that same pain in a modified way; a marked discomfort is felt in the cheek when he stoops over. The transillumination and Roentgen-ray findings are not reliable in my hands. While helpful, they are not reliable. In the cases of sarcoma the roentgenogram is often the same

as with other antrum involvement, especially the acute cases. The only thing that can help would be the difference in the intensity of shadow, but there is very little shadow in the chronic and subacute antrum cases, while in a sarcoma you get a very intense shadow. And it makes a great difference whether you plunge your trocar into the antrum if you have thought it filled with pus and find it to be a sarcoma. So I think the Roentgen-ray, while valuable, is by no means reliable. In my own case I find that the throb of pain in the antrum, from the heel coming down hard on the floor in walking, is pathognomonic in acute antrum cases, and the feeling of fullness and slight distress in the cheek bone from stooping far forward is pathognomonic of subacute or chronic antrum. These symptoms far surpass any and all others.

DR CHAS. A. LEVY, Saint Louis, Mo.: I have enjoyed the good paper by Dr. Dutrow, also the interesting discussion on same. My experience in sinus work, in my own case for instance, when it comes home to us we think: which is the easiest and safest way out of such conditions? Many times operations, instrumentation and washing can be prevented by assisting nature in the following way:

In acute or chronic conditions I spray the nose with a one per cent solution of cocaine in liquid albolin, then place a small piece of cotton, saturated in liquid albolin, loosely between the septum and the ethmoid region. In chronic cases I usually spray into the cotton a 10 per cent solution of argyrol and leave same in nose from fifteen to thirty minutes. After removing cotton I use hand suction apparatus or electric suction method. These treatments are to be given daily. Where there is evidence of absorption eight drops to three c.c. of mixed infection phylacogen injected subcutaneously will increase the patient's resistance, thereby being a great help in such cases.

DR. C. F. PRINGSTEN, St. Louis, Mo.: In regard to this celebrated paper which we all read pertaining to antrum punctures and fatalities, I have been able to trace three cases of near death from antrum puncture among some of my colleagues in St. Louis, and the thought occurred to me, what is it about this that makes it a hazardous procedure? Up to that time I had been inflating air into the maxillary sinus before irrigating. Since then I have abandoned that procedure and have talked to a number of colleagues, and instead of using air inflation first I irrigate. I think this point should be considered in regard to fatalities.

DR. HOWARD A. DUTROW, Dayton, Ohio (closing discussion): I wish to thank the members of the academy for their very generous discussion on this very important subject. I regret very much that I had to delete much of my paper. I had to pass over two or three pages on account of shortness of time which broke the sequence. We all realize that this is a clearing house for experiences, and we all come here to be benefited mutually by relating our experiences. It must not be lost sight of that it was my original intention to deal essentially with chronic cases; that class of cases that come to us referred by the general practitioner and the dental profession. This class of cases usually has been gone over thoroughly by the family physician or an internist in the search for the cause of his illness but

without avail. The patient comes in and says he has been sick for six months. The teeth have been rayed and the tonsils have been given care but the patient still is sick. This class of cases is very often getting absorption from a focus within a sinus, and are the cases that, as a rule, are hard to diagnose.

As to the percentage of cases due to infected teeth, I simply related my own experience and that can easily be accounted for in this way: it probably happened that I had a greater number of cases coming from dentists that were due to dental caries.

I realize that there must be several methods of operating these cases. We cannot lay down any rule that will be applicable to all. That is conceded generally. Someone mentioned that they would not care to have an opening in the inferior meatus for dust and infectious material to enter. The turbinate will take care of that if it is not removed, which, as I stated in my paper, is not necessary.

Regarding drainage and ventilation, I think we should not overlook ventilation. Ventilation, to my mind, is most important in maintaining a healthy condition within the sinus.

About Gording's paper, I believe he did not mention that he took a great deal of care in shrinking up the mucosa in the middle meatus. I believe in these cases, that if the mucosa is thoroughly shrunk in the meatus, and the ostium made as patulous as possible, we will have very little disturbance within the antrum.



## EVOLUTION OF THE FRONTAL SINUS OPERATION, WITH A PRELIMINARY REPORT OF A NEW AND SIMPLE OPERATION

JOSEPH C. BECK, M.D.

CHICAGO

The subject of the frontal sinus seems to have been very thoroughly discussed, hence I will not take up your time in describing the various operations, except to refer to them with the illustrations by means of the lantern.

I wish to say, however, that as yet there is not a satisfactory operation for the cure of chronic sinus disease, unless perhaps it be the Killian. In that procedure we can certainly expect a cure of the disease, but we will have to expect also a certain amount of deformity. This question of deformity as well as the correction of same, I will take up later.

The points I wish to present are (1) A report on the Lothrop operation. (2) Experience previous to Lothrop, with my osteoplastic operation. (3) My experience with the Lynch operation, and (4) The procedure mentioned in the title as a suggestion.

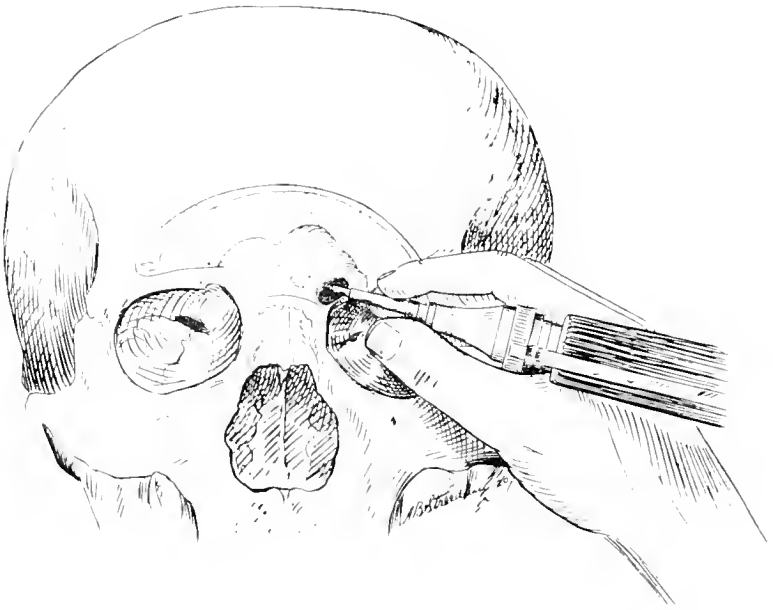
I have not had enough experience with this later procedure, nor has enough time elapsed since it was performed, so cannot report its full value, but whether it proves to be good or not, it is the forerunner, or first step, of the Lothrop operation, in other words, whatever I recommend in this procedure is a step or two for the Lothrop operation. It is less radical and more easily accomplished. The points in the operation are the making of an opening in the antero-inferior angle of the frontal sinus, otherwise known as "Ewing's Space"; then breaking through the frontal sinus septum and taking it off down to the floor of the sinus, thus allowing the opposite, most probably a normal frontal sinus, to drain the diseased side. This drainage will give the latter a chance to resolve, or at least allow the swollen mucous membrane of the naso-frontal duct to assume a more normal or patulous state.

The treatment of frontal sinus disease must be divided not only into acute, subacute or chronic states, but all the other pathologic conditions must be taken into consideration, if we are to expect results.

The rationale of this new procedure is based upon the an-

atomic formation of the ostia. The ostia or outlets of the frontal sinus differ in size; in one the opening may be small, while on the other side it may be much larger. According to Logan Turner and other observers, these outlets are of various sizes, consequently in those sinuses where the opening is small we expect the sinus to be affected rather more frequently than the one with a large ostium.

Now what happens in the operation from the nasal route? Those who conserve the middle turbinate and go into the frontal sinus by way of the ethmoid sinus, are certainly employing the same rationale, giving the naso-frontal duct a chance to recover. If, therefore, one follows the dictum of Mosher, of not touching the naso-frontal duct, but goes anteriorly, then the result may be the same as the rationale of the procedure I am recommending



today, that is, resolution of the swelling of the naso-frontal duct.

To recapitulate, I wish to bring before you as a suggestion a procedure wherein one is to communicate the one frontal sinus with the other in order to allow the closed or swollen naso-frontal duct to become free for drainage. As a result there will be a large opening between the two sinuses which should remain patent always (See illustration).

The slides to be shown demonstrate the following:

1. Anatomy of parts involved.

2. Killian's operation.
3. Beck's osteoplastic operation.
4. Lothrop's operation.
5. Beck's transfrontal operation.
6. Illustration of a case of a cured frontal sinus operation (Killian method.)
7. Illustration of a case of a cured frontal sinus by the Beck's osteoplastic.
8. Two severe cases of osteomyelitis of frontal bone associated with acute frontal sinus disease.
9. Two types of cases of frontal sinus disease cured by the Lothrop operation.
10. Two cases of frontal sinus disease cured by the Lynch method of operation.
11. Several cases of frontal sinus disease apparently cured by Beck's transfrontal operation.
12. Two cases of marked deformity of the forehead, following radical frontal sinus operation, reconstructed by means of plastic restitution, by means of fascia and fat transplant.

#### CONCLUSIONS

We have not yet developed, satisfactorily, an operation for the cure of chronic frontal sinus disease which is applicable, in the majority of the cases, and the thorough understanding of the various pathologic and anatomic state is absolutely necessary in order to choose the best method. At any rate one should attempt the more conservative methods first, and only as a last resort do the radical operation. One particular operation I have absolutely abandoned, and that is the rasping or destroying of the mucous membrane of the naso-frontal duct, or any part thereof. This of course does not apply when performing the Lothrop operation.

The procedure here proposed will in no wise do any harm to the apparently normal sinus for as soon as the naso-frontal duct of the affected sinus returns to function of ventilation and drainage, the opposite frontal sinus is not called upon to perform that function.

It is very gratifying that should one obtain a marked deformity as a consequence of a radical fronto-sinus operation, a cosmetic plastic operation of fascia or fat transplant may be done with satisfaction. The one important fact is to wait until there is no more infection present about the healed out process. Another important factor is to see that none of the supraorbital or

frontal nerves are present after the operation on the sinus, otherwise there will be marked complaint of neuralgic pains, which are hard to control.

## DISCUSSION

DR. R. P. SCHOLZ, St. Louis, Mo.: Being called upon to open the discussion of Dr. Beck's paper, takes me by surprise. While I intended entering upon the general discussion, am not prepared to befittingly open the discussion of another of Dr. Beck's usually excellent addresses. In the future, certainly we will all try out the speaker's directions in the operation suggested, and aim to gather statistics, on which definite conclusions as to the efficacy of this cleverly devised operation can be based. Several years ago, while operating on a lad of eleven years, for a right-sided frontal empyema, from which drainage could not be established intranasally, and which already showed an external extension of the inflammatory process, found it necessary in the course of operation, to open into the left side of the nose for the purpose of drainage and the removal of the tampon. The X-ray showed, in addition to the involvement of the right frontal, involvement of the left corresponding cell, but from the latter, there was free intranasal drainage. The X-ray further showed the right frontal to be very large, and to extend far over the median line with a thin partition between the two frontal sinuses. It had been my intention to do the Killian operation, but because of the great difficulty in getting through the infundibulum into the naso-frontal duct, chose the route through the left side of the nose by passing through the left frontal sinus. The greater part of the partition and some of the anterior wall of the left frontal sinus was removed, the naso-frontal duct on the left side enlarged, so as to permit the removal of the tampon, and subsequent drainage. The child made a beautiful recovery, with only a linear scar in the right eyebrow. There was no depression or other deformity, and there has been no recurrence of the trouble up to the present date. While I had been diverted from my intended route in this operation unintentionally, cite this case merely because a number of its features are similar to some of those suggested by Dr. Beck.

DR. GEORGE W. BOOT, Chicago, Ill.: There is one point in Dr. Beck's address to which I wish to call attention, and that is in regard to the case with insanity which apparently recovered after operation. In this connection I would like to give the history of a case of mine.

A few years ago we had a modest little office girl who was so bashful she could hardly look at any of the doctors without blushing. Two years ago she had a severe attack of influenza and about the time I returned from France she began to have delusions. She came to the house and told my wife how the other doctors were trying to undermine my practice, and so on. A little later she quit her job, without any trouble that I knew of. I went to see her to find out what the trouble was, and she said that people were talking behind her back and she did not like it. At last I persuaded her to go back to work and she worked for about two weeks and then said that she was going to take a vacation, but she did not return. A short time afterward her mother sent for me and I then found that she was having

definite delusions and was quite insane. She was placed in a hospital but during the cold weather of winter she escaped and ran away barefooted and clad only in a night gown. She fell exhausted after running a mile.

In that case we found very badly infected tonsils and root abscesses. The tonsils were removed and the teeth cleaned up, and I am glad to say the patient has recovered from what seemed to be a case of dementia precox.

DR. JOHN A. PRATT, Minneapolis, Minn.: It is hard to get a 100 per cent operation for anything, but before doing a radical operation on a frontal we should try the intranasal operation. Last year I read a paper before this society regarding exenteration of the ethmoid by operating under the turbinates, and I continue this operation in opening into the frontal. The naso-frontal opening can be enlarged by the nasal rasp which de-roys only the anterior membrane of the duct. This work can be easily done in the office or dispensary. I have a set of malleable curettes, with which certain parts of the frontal can be curetted, and the after treatment is suction, passing the suction tube into the frontal sinus. It is surprising what good results you can get by the simple intranasal method. If this does not cure the case it is easy to go to the more radical operation. It looks as if the suggestion Dr. Beck has given is one of the things well worth following.

DR. HOWARD V. DUTROW, Dayton, Ohio.: Dr. Beck brings up a very large subject in the surgical treatment of frontal sinusitis. I think the thing that has concerned most of us in years gone by is the extreme deformity following operation. I never was much impressed with the Killian operation for that reason, feeling that it was too radical. Here, again, the roentgenogram will tell us a great deal as to whether one or both sinuses are affected. Recently I had a case that showed left frontal sinusitis, with the septum absolutely intact. The right sinus was perfectly normal. The modified Killian, as I have been calling it, was done—perhaps not as much as a modified Killian. I simply made an incision through the eyebrow and thoroughly cleaned out the sinus, taking care not to break through the partition to the other side, and a large opening was made through the nose, an opening as large as a lead pencil or the small finger. One that will not close. I do not pack these cases; I do not irrigate them. I depend on gravity drainage. If the opening is large enough, with the patient in the upright position, if there is anything in the sinus it will drain by its own gravity.

I think the Lothrop operation offers us a great deal in dealing satisfactorily with drainage and permanent cure in these cases.

I again want to emphasize the importance of absolute thoroughness in all sinus work. You must clean out every vestige of diseased mucuous membrane if you are going to get a good, permanent result. I do not believe in temporizing with these cases through the nose. That to me has never appeared the proper procedure where the sinus is full of pus and granulomata. You cannot clean out the sinus even if you have a large nasal opening. You are sure to leave pathologic tissue in the fan shaped ramifications of the sinus which will proliferate and again fill it up requiring a second or a third operation.

The only way to get at it is to attack it directly through an external opening.

DR. CHAS. D. THOMAS, Peoria, Ill.: I have not had a large number of these cases, but have used the same procedure that Dr. Beck now promulgates in one of my cases. It happened, in a way, by accident; I had not planned out any operation. I had purposely avoided a Killian operation on account of the fearful scar over fifteen years it makes. I was using the trephine, like a good many others at that time, in all my bone surgery. The case had progressed far enough so that the brow was bulging and showed me positively, without further questioning as to the diagnosis, that it was a frontal sinus abscess. In the usual way I made by incision along the lower line of the brow. The patient was a woman and I tried to avoid a scar; after denuding thoroughly I went in very easily almost on the brow line. The opening was quite easily made because there was a good deal of degeneration of the bone. In cureting this quite large cavity I must confess that I rather accidentally went through the septum leading to the frontal cell on the other side. This recalls to my mind that my drainage ultimately went through from the left frontal to the right cell. I then went in with my curved curet and made a very large opening and only went into the nose on this side (indicating left side). I found that this case required irrigation once or twice a day for six months and I thought I got a very good result. There is nothing more than a dimple right under the brow as the only scar. And from the other frontal cell my irrigation soon began to show, proving that the ventilation there had established drainage on the other side also.

DR. R. C. LYNN, New Orleans, La.: In my experience with the radical operation on the frontal sinus, as it relates to the work Dr. Beck has done, I would say that in one case where the left frontal sinus was the source of disease and was operated upon, we found a small sinus leading through the partition to the right frontal sinus. We took the partition down entirely, as Dr. Beck has described, and also the septum incision as Lothrop has described, being able to get a small probe from the left infundibulum into the right frontal. The wound healed but it was necessary to operate on the right frontal sinus about eight months after the left was operated on. At that time we found the right frontal sinus to contain pus. In that instance, then, if the diseased sinus is drained into the health sinus, we felt that in that case it infected the healthy sinus, making operation necessary later.

I will ask Dr. Beck in closing to give us some information about the Lothrop operation, perhaps laying stress upon the fact that the granulation closed up the openings in the Lothrop operation. That was my reason for objecting to the Lothrop operation and led me to look for some substitute on this account. No matter how large the openings were at the time of operation, they invariably closed, unless the patients were kept under observation for months afterward, and in patients from out of town this seemed impossible.

In some of the cases which we have operated the disease has been bilateral, with practically no partition formation at all. Practically,

the operation was done by nature, except for toning down the septum, so it was perfectly easy to get into the sinus before operation. In that instance a complete double-sided operation was done, with a perfect result.

We have had, recently, two cases in which, due to the peculiar shape of the skull and extremely over-hanging brow, in which the space between the root of the nose, or the glabella, and posterior wall or brain wall, was so narrow as to practically prevent free drainage, it was impossible to get good results under Dr. Beck's scheme. I wish he would say something about that in closing.

DR. JOSEPH C. BECK, Chicago (closing discussion): Two gentlemen have reported cases that they had observed, coincidentally with the operation, by accident—not intentionally—noted sinus communication between one sinus and the other, and that the cases recovered. That speaks for the fact that such a thing as I am proposing is possible and rational. I stated in the beginning that I am not advancing this operation as a cure-all for frontal sinus disease. I stated distinctly that we differentiated entirely on the changes that have taken place in the sinus. So Dr. Lynch's remarks about the breaking through of the sinus,—in such a case there would be no use of doing this operation because the pathology is already far advanced and both frontal ostia are closed. In those cases, not even the Lynch or the Lothrop operation would be of use, but only the Killian. In those cases where there is marked progress of the disease with posterior table destruction, necessitating removal of the bone, it is a life and death proposition and such a proposition as I have advocated today is not indicated.

The other cases that Dr. Lynch referred to would interest me very much. First, the reformation of the sinus. He says that one frontal sinus was infected and the other got well. The fact that the sinus was obliterated by granulation explains that.

Now, those cases to which I am trying to apply this treatment are the following: Those cases that after local treatment of the nose, suction or what not, and after you have made an opening into the frontal sinus intranasally, the operation recommended by Mosher and others, and the case is still discharging. Therefore, the operation recommended by Dr. Pratt does not seem to be of any advantage because I called attention to the changes that occur about the naso-frontal duct after all the other operations. It is a cancellous bony material and even if the opening you make be as large as your finger as Dr. Dutrow said, they close, and probing afterward is a useless and often dangerous procedure.

I wish to mention, in connection with Dr. Boot's remarks, that these mental cases represent a very interesting topic. I think the association would do well to bring up this topic of operating on mental cases. Dr. Stuckey has done some very interesting work on dementia precox cases. I have recently operated on a man with dementia precox, in the state hospital at Dunning, for sinus disease with beneficial results. I do not say he is cured, but he is manageable and works, and it a great relief to the people there. The man I mentioned in the paper and whose picture I showed is not yet right.

## OBSERVATIONS ON THE PALATINE TONSIL\*

C. W. M. POYNTER, M.D.

OMAHA, NEB.

The large amount of literature for which the tonsil has been responsible makes one hesitate to add to an already overburdened field. However, it is impossible to attempt a review of this literature without being impressed not only by the apparent uncertainty as to the best methods of procedure in operative work, but more especially by the fact that the development of operative technic has been largely a clinical development. It seems to me that in this, as in other regions, all operative procedures must ultimately rest on an anatomic basis. It is interesting to find that, relatively, such a small amount of research has been done from a morphologic standpoint, when the tonsil has attracted so much attention through its pathology.

Since the textbooks are so abridged in their anatomic descriptions as to be almost valueless to the laryngologist, and the special papers which contain valuable data are so widely scattered as to be generally unavailable, it has seemed proper to review the less widely known facts of tonsillar morphology and to add to these from my own research certain details which should claim your interest.

Comparative Anatomy—The palatine tonsil belongs exclusively to mammals, in which group its distribution is very general if it is not present in all. It is represented by a number of different types. These have been classified in the excellent work of Hett and Butterfield (1909) according to their complexity. A study of these forms in conjunction with the human embryology of the region is extremely interesting and helpful in explaining the variations encountered in the operating room. The simplest type consists of a flattened tube opening out of the pharynx and extending forward parallel to the tongue. It is lined with epithelium like the pharynx and is surrounded with lymphoid tissue. This type is found in the tiger and, slightly modified, in the cat.

The pocket type is rather more complex, the tube is slightly shorter and broader and the lower lip of the pharynx

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\*From the Department of Anatomy, Univ. of Neb., College of Med., Omaha.



geal opening, tends to have a greater development of lymphoid tissue. This form is common to a wide range of mammals.

The third form has been designated the solid or projecting type, and on first consideration would seem to have little relation to the two preceding; but when we consider that the effect of an accumulation of lymphoid tissue about the tube would be to push the epithelial lining of the tube outward to cover the surface and crypts of the mass, the relationship becomes clear. This form is well represented in the dog. A study of these simpler types adds to embryologic evidence in settling the controversy over the so-called supratonsillar fossa in man. Hett and Butterfield conclude that "The form and direction of the diverticulum around which the tonsil is developed is important \* \* \* according to whether the tonsil is of one type or another the diverticulum becomes apparently supratonsillar or obviously intratonsillar. \* \* \* It is reasonable to suppose that the supratonsillar fossa of man represents the cavity of the original diverticulum around which the tonsil develops." I will have more to say of the supratonsillar fossa in conjunction with development.

The fascia is present in all forms enclosing both the lymphoid tissue and the mucous glands and their ducts. As we pass from the simple to the complex type found in man, there is a constant tendency to increase of lymphoid tissue in the region of the lower lip of the tube till the mass comes to lie largely below the lumen, and indeed the tube comes to appear independent of it. The students of the comparative types are of the opinion that the plica semicircularis represents the upper lip of the simple tube and the plica triangularis represents the under lip in the structure as it appears in man; in other words, there has been an adjustment of the parts due to the massing of the lymphoid tissue in a different position and degree in man. Various comparative studies have shown that there are three quite distinct lymphoid masses to be considered as constituents of the tonsil and these are represented in varying degrees in the different species. All three are represented in the human tonsil and the variation in their development accounts for the different types found in man.

Development.—The embryology of the tonsil is interesting and suggestive because of its similarity of beginning and close relationship to the thymus and thyroid glands. For an extended period it is an epithelial structure and only later ac-

quires lymphoid tissue. It was first described by Kölliker as an outpocketing of the pharyngeal mucous membrane occurring in the fourth month. Hammar (1903), who has made one of the most complete studies in the literature, showed that its initiation is very much earlier and that it is a diverticulum from the second pharyngeal pouch. As the tonsillar outpocketing (sinus) becomes deeper, 31 mm. stage, the anterior border or lip of the orifice assumes the character of a distinct fold, extending downward, and may now be recognized

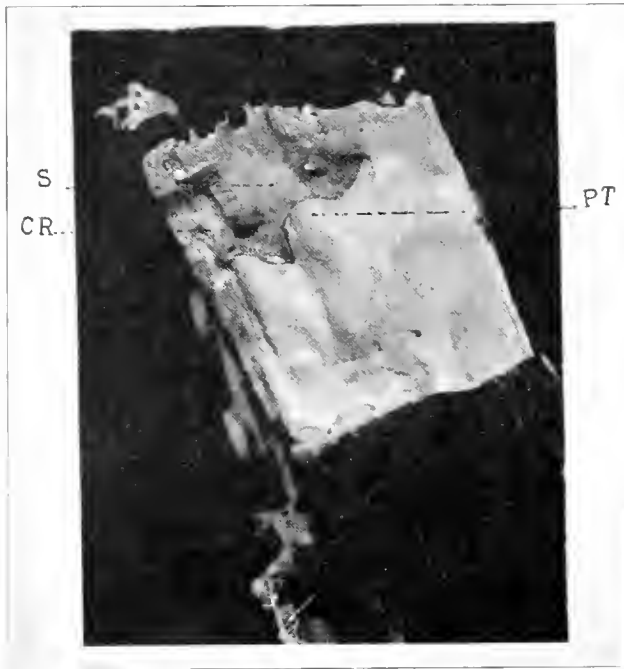


Fig. 1. Wax reconstruction of pharyngeal wall and tonsillar sinus of a 145 mm. embryo. S, tonsillar sinus; CR, secondary crypt; PT, plica triangularis, which is well defined at this time. In this model it hides two other secondary crypts.

as the plica triangularis. I have called attention to the plica triangularis because it appears at an early stage and is important in defining the tonsil of which it is a part. It cannot be interpreted as a simple fold of mucous membrane related to the anterior faucial pillar, as is frequently incorrectly done.

From the walls of the tonsillar sinus solid cords of epithelium grow down into the subjacent tissue, hollow out and so form the secondary crypts. Later, 140 mm. stage, lymphoid

tissue has appeared about these tubular crypts. Fig. 1 shows the development of an embryo of 145 mm. stage. At this time the lymphoid tissue is in three separate masses. These may be designated as postero-superior, middle and inferior masses. The tonsillar sinus is still clearly defined and secondary crypts run into each mass, Fig. 2. At a later period, 235 mm. stage, secondary nodes appear in the lymphoid masses, giving rise to the follicular appearance of the adult type. The source of the lymphoid tissue is still unsettled, but I am of the opinion that it is a differentiation of the surrounding mesoderm.

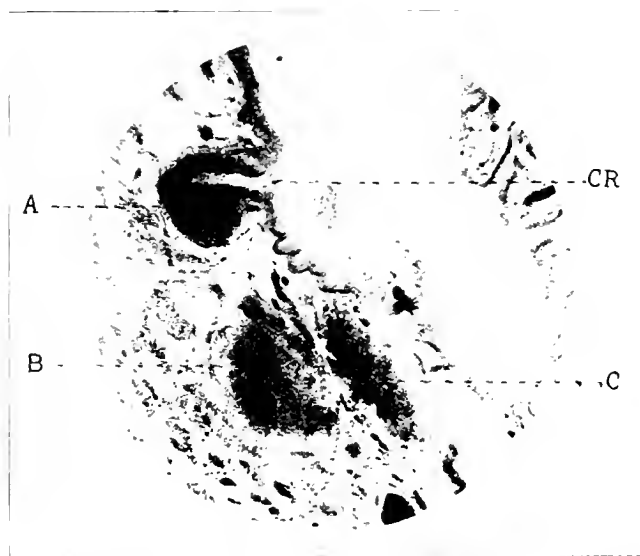


Fig. 2. Photomicrograph of frontal section through tonsillar region of a 145 mm. embryo, showing a secondary crypt and the lymphoid tissue developing in three separate masses. A, postero-superior mass; B, middle mass; C, inferior mass. A blood vessel may be seen running between the lower masses.

As in the thymus and thyroid, the tonsil is primarily an entodermal tube, which becomes a complicated system of crypts about which lymphoid tissue develops quite similarly, apparently, to the lymphoid tissue about the epithelial elements of the thymus and thyroid. The ultimate form of the tonsil and its crypts depends upon the relative development of the lymphoid masses. If the middle mass develops most, as seems to be the usual rule, the globular type of tonsil results. The postero-superior mass may develop excessively,

in which cases the superior tonsillar fossa is not only obliterated, but the upper pole of the tonsil overhangs the body like a helmet, Killian (1898). If the greatest development occurs in the inferior mass, the plica triangularis seems to be wanting and the tonsil extends forward to near the anterior pillar of the pharynx. In the majority of cases the three masses fuse to such an extent that they can be identified only by the circulation and capsular extensions, but I have frequently found, in the adult, such a division of the masses that the embryonal condition could be readily recognized, Fig. 3.

No definite capsule has developed during the period just

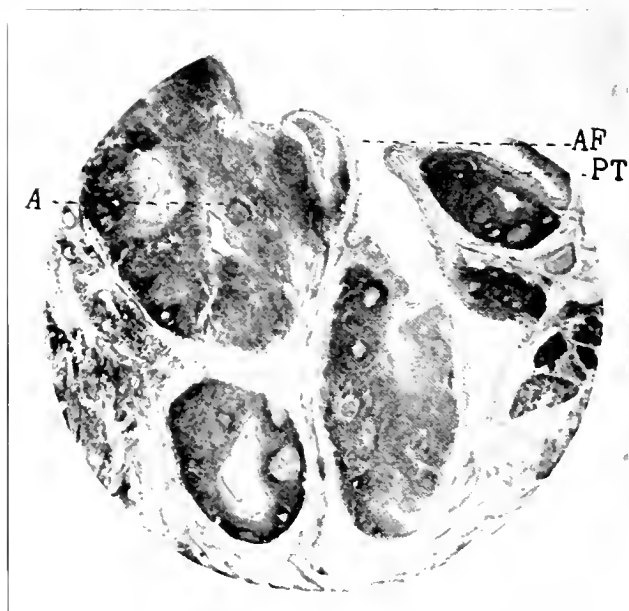


Fig. 3. Photomicrograph of transverse section through tonsillar region in adult showing separation of the lymphoid masses. AF, anterior tonsillar fossa.

reviewed and its later development is as a condensation of the loose mesenchymal tissue which surrounds the tonsil and separates it from the surrounding musculature. The vascularization of the tonsil occurs early, and from the richness of the blood supply suggests a center of great functional activity. Since I can detail only the points of greatest interest in conjunction with the general circulation, I will not burden this section with the successive stages of vascular development.

Gross Anatomy.—In addition to the study of the develop-

mental stages in the embryo I have studied the adult by frozen section, dissections and microscopic sections of the tonsil in situ.

When the head is cut in midsagittal section, as shown in Fig. 4, it will be noted that the tongue nearly fills the buccal cavity and that the tonsil does not form a prominent projection into the pharynx. The anterior pillar cannot be discovered as a ridge, for the palato-glossus muscle lies behind the smooth wall of the pharynx. The tonsils do not face medialward with their exposed surfaces, but rather forward or ventrally. This can be better appreciated by inspection of a trans-section through the tonsillar region, Fig. 5. The picture with



Fig. 4. Midsagittal section of adult head. The uvula has been drawn back and up to expose the tonsil. Note that the anterior pillar does not stand out in relief and the tonsil looks forward rather than inward. T, tonsil.

which we are familiar on inspection of the pharynx is brought about by a depression of the tongue downward and forward. This produces traction of the anterior pillar and its related structures so that the pillar is thrown into relief, and the tonsil is rotated inward and made to protrude into the space created by the displacement of the tongue. We must then study the tonsil for position and relations with the mouth closed.

Supratonsillar fossa.—I have already shown, both from a comparative standpoint and from development, that we must consider the tonsil as an evagination from the pharyngeal wall and that irregularities in extent and arrangement of crypts

are found in species and individuals. The irregularities in the development of crypts are interesting in at least two particulars. The upper portion of the sinus, by the 145 mm. stage, has developed a deep crypt which is surrounded by a mass of lymphoid tissue, which has been designated the postero-superior mass, Fig. 2. As viewed from the pharyngeal side, the tonsillar sinus seems to be bounded above by a fold which is the plica semicircularis. His, I believe, first named the space just below this plica, the fossa supratonsillar. As has been repeatedly pointed out by recent investigators, this term is misleading in that it suggests an extratonsillar area. This is quite contrary to facts, for this space, from the beginning of

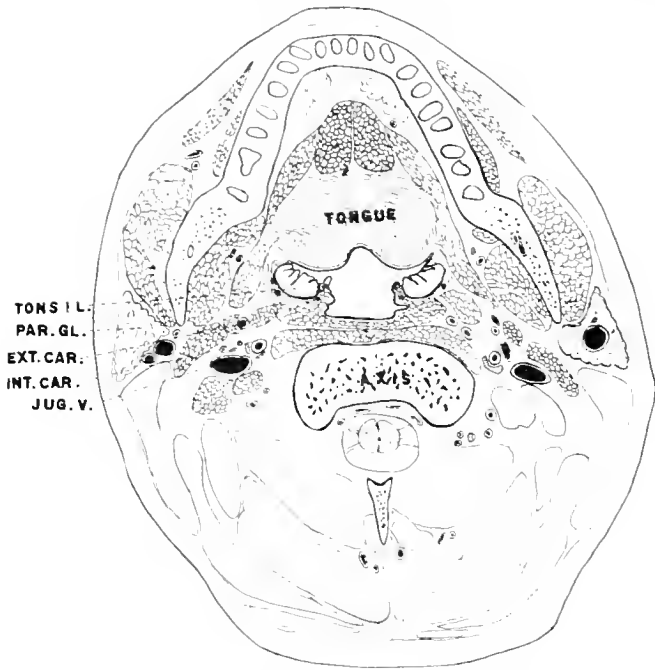


Fig. 5. Drawing of a frozen section cut through the tonsils. This shows the tonsils looking forward rather than inward, and gives their relations to the muscles and great vessels.

development, is within the tonsillar sinus, indeed a part of the tonsil. Killian (1898) has shown that this fossa is the same as Tourtual's cavity, and that it is surrounded with lymphoid tissue. Fraser (1910) emphasized the fact that the capsule of the tonsil is above the fossa and Hett (1910) has proven through his splendid comparative study that the fossa is a definite part of the tonsil. A study of Fig. 2 will show

the lymphoid mass and secondary crypt within the fossa, and Fig. 6, which is a section from an adult taken above the pharynx, shows the extension of the fossa upward, and that it is covered on its medial side by lymphoid tissue and capsule. The space in this latter section is in fact the crypt of the supratonsillar mass, or, as Fetterolf has suggested, this should be called the superior tonsillar fossa.

I have not found that the retrotonsillar plica requires special mention in this study, but the plica triangularis has not

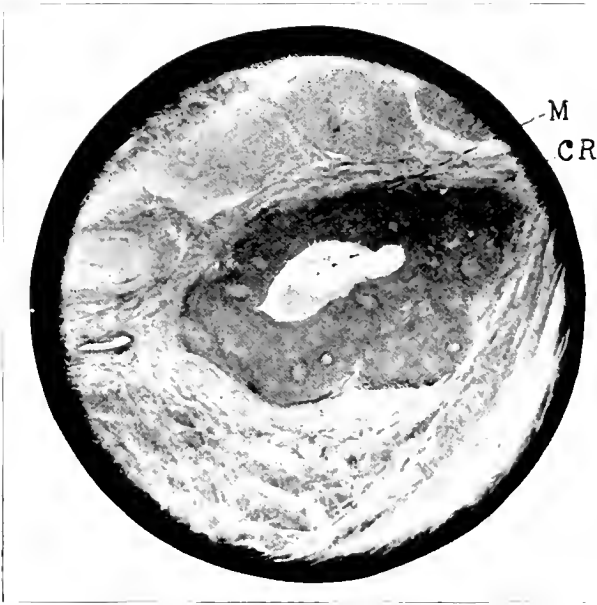


Fig. 6. Photomicrograph of section taken through the superior tonsillar fossa of an adult. It will be noted that there is lymphoid tissue bounding the medial as well as the lateral wall of the fossa which would not be the case if the fossa were extratonsillar. This fossa is the developed secondary crypt appearing in the postero-superior lymphoid mass in the embryo. M, medial wall of superior tonsillar fossa.

been properly emphasized in text descriptions. Hammar has shown that the plica triangularis is an early development of the tonsil and marks the division between the anterior and posterior outgrowths, Fig. 7. Somewhat later the plica is seen to contain a greater or less amount of lymphoid tissue, Fig. 8. Just as in the case of the superior tonsillar fossa, the plica triangularis must be regarded as a part of the tonsil and the space behind, a secondary crypt, may be correctly designated

the anterior tonsillar fossa. Fetterolf (1912) has made this clear in his Fig. 4, to which attention is called. With this conception we may eliminate the terms free and adherent plica, which are somewhat misleading, and understand that the conditions which have led to these designations are dependent on the extent to which lymphoid tissue develops in the medial wall of the "anterior tonsillar fossa." Figs 3 and 9 show lymphoid tissue in the plica.

There should be no great difficulty in interpreting the various types of tonsil encountered in the operating room, if we

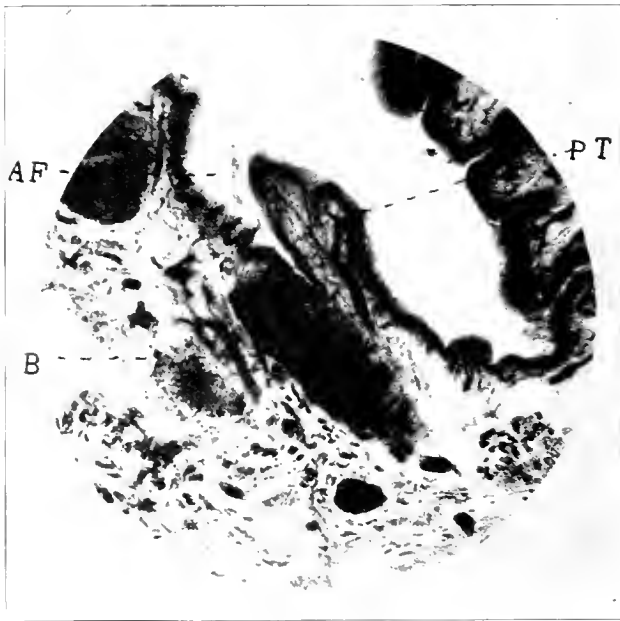


Fig. 7. Photomicrograph of section through tonsillar region of a 145 mm. embryo showing the relation of the plica triangularis to the middle tonsillar mass. The vascularization of the plica is also shown by the section.

keep in mind the three principal foci for the development of lymphoid tissue and recognize that the differences in the relative development of these cause the type variations encountered, and that these variations are *within the capsule*. I have found capsular relations to the pillars relatively constant.

Circulation.—From the careful reconstruction of the arterial circulation from several serially sectioned tonsils, it seems quite definitely settled that there is a wide variation



in the points of entrance and the regions supplied by the different tonsillar rami. These variations can be explained by the fact that different embryonal masses are supplied by different arteries, and the variations in the development of the masses will result in some displacement of the arteries in different directions, depending on the type of adult tonsil. In discussing, then, the arteries of the tonsil, it is not possible to give a definite position for any one of the rami, but a more or less general statement must satisfy. Figure 10 represents the average position of the arteries determined by the examinations made.

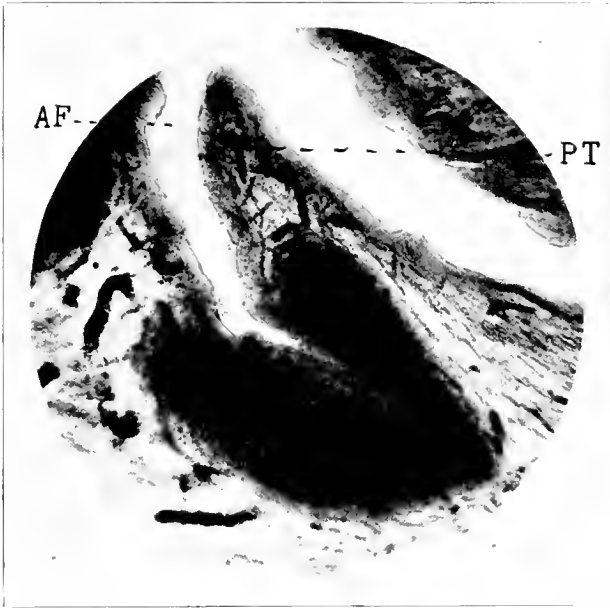


Fig. 8. Section of same region shown in Fig. 7, but taken from a 200 mm., embryo showing the invasion of the plica triangularis by lymphoid tissue.

The superior tonsillar mass is early supplied by a ramus from the descending palatine branch of the internal maxillary. This frequently divides at some distance from the tonsil into two branches, one of which passes medial to the superior tonsillar fossa, while the other supplies the lateral portion of the upper pole region. This vessel enters the capsule from above and somewhat dorsal to the middle. It has been constant but not large.

The posterior tonsillar mass receives a supply from two sources, the ascending pharyngeal and the ascending palatine. The ramus from the ascending pharyngeal enters the tonsil on the dorso-lateral aspect; it may be near the lower pole or as high as the middle. One embryo was encountered in which there were two rami from the ascending pharyngeal, one entering the mass near the lower pole and one at the upper pole. A distinct ramus for this region may be lacking and the vessel is generally slender. The other vessel, from the ascending palatine, passes between the inferior and middle tonsillar

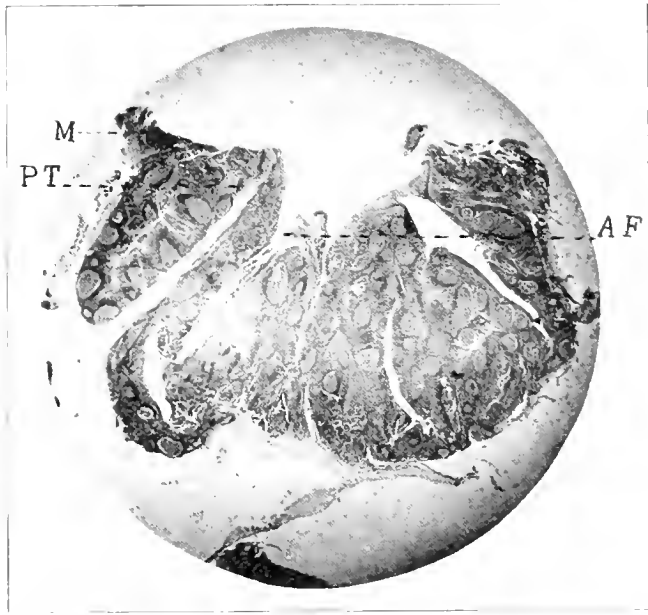


Fig. 9. Transverse section of left tonsil showing lymphoid tissue in the plica triangularis and a portion of the mucous membrane attached. This might be termed "adherent plica"; the anterior tonsillar fossa is some little distance back. M, mucous membrane.

masses and sends branches to both. As fusion of the masses is finally accomplished the arteries persist, so that the tonsillar ramus comes to supply the lateral aspect of the whole tonsil. This vessel is one of the largest going to the tonsil. It is hardly correct to speak of this vessel as a single one, for there are a number of variations which have been encountered: (a) a single vessel from the ascending palatine may pierce the constrictor and run up between it and the tonsil; or, (b) there may be two vessels from this same source given

off at some little distance from each other; or, (c) there may be one branch from the source just mentioned and one ramus directly from the external maxillary; or, (d) two branches may be supplied directly from the external maxillary and none from its ascending palatine. Our immediate interest is rather in the distribution to the tonsil than the source. I have found that generally there is a branch which pierces the capsule near the lower pole; this is the same vessel which first supplied the lower tonsillar mass. After furnishing this ramus the main trunk may continue upward in relation to the capsule to a point near the middle of the tonsil on its lateral

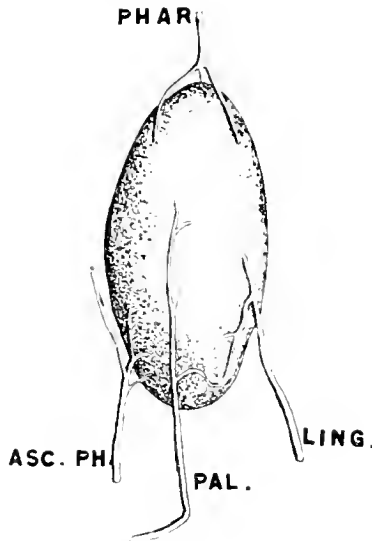


Fig. 10. Reconstruction of the arteries of the tonsil showing relations and distribution. PHAR., branch of descending branch of internal maxillary; ASC. PH., tonsillar branch of ascending pharyngeal; PAL., tonsillar branch of ascending palatine from the external maxillary; LING., tonsillar branch of the dorsalis linguae from the lingual. Drawing is of the right tonsil viewed from the outside.

aspect, where a second branch enters the tonsillar tissue. This branch may be the terminal or, after giving off this branch, the terminal ramus may continue for some distance before entering the capsule. If this supply is represented by several rami from different sources our interest is only an academic one, but if from a single source, the vessel may be of considerable size and consequently the source of a sharp hemorrhage, which will be in the middle of the outer aspect, somewhat above the lower pole.

The middle tonsillar mass is supplied, in addition to the branch just mentioned, with rami from the dorsalis linguae of the lingual. I have found quite constantly two vessels which are given off from the dorsalis linguae a short distance apart; one goes to the antero-lateral aspect of the mass and the other to the medial aspect, i. e., to the plica triangularis. In the adult tonsil both of these rami persist and occupy the same relative positions. One, the larger, may be said to pierce the capsule near the lower pole of the tonsil on its anterior aspect, the other at a point somewhat higher. In a tonsil normally vascularized I can conceive of only two arteries causing troublesome hemorrhage, viz., those from the external maxillary and lingual, and they are situated in the lower antero-lateral pole region. It should always be remembered that the entire arterial supply of the tonsil is from the external carotid which can be readily compressed should the emergency require. The artery of the plica triangularis may be termed in the adult the anterior tonsillar artery. It is a small radicle and pierces the capsule on its anterior border near the junction of the middle and lower thirds. As Walsham has pointed out, other vessels which supply the mucous membrane of the pharynx also contribute to the supply of the tonsil in a small way and anastomose with the vessels just reviewed.

Veins.—Shortly after the pharyngeal plexus begins to develop a deeper network of veins appears. These are arranged about the epithelial crypts and by the 145 mm. stage have covered the tonsillar masses as a complicated network. As development proceeds, this plexus, which may be called the tonsillar plexus, comes to lie in the space between the tonsillar mass and the constrictor muscles. The plexus drains into the internal maxillary vein above, into the lingual anteriorly and into the palatine below. The veins coming from the tonsil pierce the muscle in many places, taking apparently a direct route to join the plexus. In the adult the general arrangement may be seen in Fig. 11. A small vein runs down near the tonsil and just behind the anterior faucial pillar. A confluence of veins is found just outside the capsule on the postero-lateral aspect of the tonsil, near the lower pole. From this point a large vein leads outward to join the pharyngeal plexus, or, as in the Fig. 11, opens directly into the internal jugular vein. This posterior lower pole area becomes then the "danger area" for hemorrhages, on account

of the size of the vein and its close relation to the capsule. When it opens into the jugular the danger of hemorrhage would naturally be greater and the possibilities of jugular thrombosis much increased.

**Capsule.**—We are accustomed to speak of a tonsillar capsule, but it is rather difficult to demonstrate this as a definite morphologic entity. In the earlier development the lymphoid masses form in the areolar tissue between the mucous membrane of the pharynx and the surrounding muscles. Later there is more or less condensation of this tissue outside of the

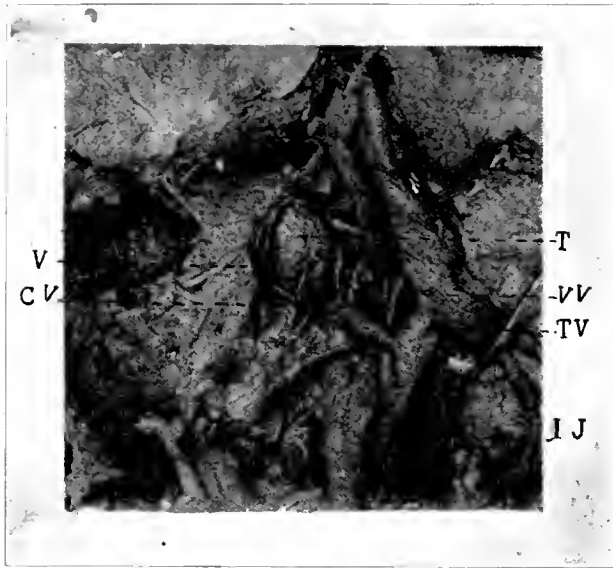


Fig. 11. View showing the relations of the veins to the tonsil as seen on the left side in an adult. The muscles have been cut away exposing the lateral aspect of the tonsil. T, tonsil; V, vein behind the anterior faucial pillar; CV, confluence of veins on the lower posterior border of tonsil; VV, vein passing upward in relation to dorsal border of tonsil; TV, vein connecting tonsillar plexus with internal jugular vein; IJ, internal jugular vein.

masses and between them, so that we have a sheet of connective tissue outside of the tonsil and running through the tonsil at various points. It does not seem that there is ever a very great condensation at the upper pole, so that one may say that the upper half to two-thirds of the tonsil rests in a bed of loose areolar tissue which separates it to a considerable extent from the muscle. When the tonsil is dissected out, this tissue falls into a plane and has the appearance of a defi-

nite sheath, but from examination of carefully prepared microscopic sections of the organ I cannot discover thickened or condensed plane of tissue. In the lower region of the tonsil the areolar space is very much narrower and the tonsil comes so close to the muscles that the usual methods of enucleation generally remove small portions of the muscle. Hett (1910) has called attention to this point, with which I agree, only I would go farther and say that from examination of microscopic sections it appears that muscle fibers insert in the tonsil near the lower pole. This condition, together with the fact that the important vessels are located here and the region is the most inaccessible, will explain the surgical difficulties encountered with the lower pole of the tonsil.

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## THE CLOSED METHOD OF DEALING WITH TONSIL- LECTOMY WOUNDS

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Since the epoch-making work of Greenfield Sluder, a tremendous amount of study has been given to the tonsil problem, which has now been practically solved so far as the mere removal is concerned. I am asking your indulgence today while I endeavor to emphasize the importance of a more rational management of the tonsillar wound after extirpation.

It must be freely admitted that all of the many procedures for the radical removal of the tonsils and the control of the attendant hemorrhage have thousands of excellent results to their credit. It is prudent, however, not to be content with that which has established merit if there is anything else that can bring us closer to the ideal for which we strive.

There are three kinds of hemorrhage to be considered in tonsil surgery; first, immediate hemorrhage occurring during the operation or immediately thereafter; second, a form of reactionary hemorrhage occurring within a few hours during the period when the general system is reacting from the depression of the general anesthetic, or when the wounded tissues are reacting from the artificial anemia produced by the application and injection of local anesthetics in the region of the operative field; third, a true secondary hemorrhage occurring after a few days and dependent upon the rupture of newly formed blood vessels of the granulating surface, or upon the sloughing of blood vessels previously occluded by pressure, ligation, styptics or cautery.

Now, the procedure which most effectually reduces to the minimum all three of these forms of hemorrhage is the one which is surgically soundest. A survey of the field of general surgery must lead, inevitably, to the conviction that the maximum security against hemorrhage in all parts of the body is attained by ligation of bleeding points, and the immediate closure of the open wound by some form of dependable suture. Nature knows but two ways of healing wounds, first, by primary union or first intention, second, by granulation, or second intention.

By the first method all three forms of hemorrhage are rendered practically impossible. By the second method the way

is left open for the possibility of all three forms of hemorrhage, and no one can ever be sure what the future will bring. I take it, then, that there can be no argument that the ligation of bleeding points, if such there are, and the immediate closure by sutures of the tonsillar wound will give us the greatest possible security against hemorrhage of all sorts provided this procedure results in primary union.

Now, it is the aim of surgery in all parts of the body to secure complete primary union if practicable, and when not practicable, on account of suppuration in the wound or beyond the wound, the object is clear to limit the granulating area to the requirements of drainage, securing as much primary union as possible.

Why is it, then, that in all other parts of the body we strive for primary union and then deliberately convert a clean tonsillectomy into an open granulating wound? There are several reasons. In the first place the modern tonsillectomy has been an evolution from the old tonsillotomy performed under crude conditions without making any effort at complete extirpation. The infected tonsil stumps should not have been covered up because suppuration would have been inevitable, just as in the case of suppurating lymphatic glands of the neck if enclosed by overlying layers of muscles, fascia, and integument. But we constantly observe that a clean dissection of cervical lymphatic glands is followed by closure of the wound and primary union.

Moreover, I have abundantly demonstrated, again and again, that a clean tonsillar fossa can be closed completely with resulting primary union by judiciously approximating the palato-pharyngeus, the palato-glossus and the fibrous covering of the superior constrictor. But it may be urged that this brings about an abnormal condition not originally intended by nature. The same may be said and, indeed, has been said many times with reference to the tonsillectomy itself. It is said that nature placed the tonsils in the throat and therefore they should not be disturbed. It may also be said that the tonsils were intended to separate the pillars of the fauces, but it is, evidently, universally true that they likewise bind the pillars together, sometimes in direct contact. Again it may be answered that while the tonsils do actually bind the pillars together, they are not held so close together as after primary union with obliteration of the fossa. Quite true, but this added proximity is not so marked a change in position as that which results when a tonsil is removed and the pillars swing



farther apart like the lateral walls of a hammock stretched across the throat.

Moreover, the primary separation of the pillars following a tonsillectomy is not a constant condition and varies with different individuals. The open wound must heal by means of granulation tissue, the extent of which is variable. But this we know, that the final state of granulation tissue is always scar tissue, and the more granulation tissue we have the more scar tissue we have, and when the inevitable contraction of the scar tissue occurs, who can measure how tightly these unfortunate pillars may be finally bound together. And then we should have, not only approximation of pillars but the added mass of scar tissue, rigid, unyielding, and uncertain in its influence upon the movements of the pharyngeal muscles.

In many cases, whatever may have been the primary position of the palato-glossus, after tonsil extirpation its final state is that of atrophy without producing any discoverable deterioration in the function of the pharyngeal muscles acting together. To-day my hope has been to emphasize the value of this procedure in the successful control of all forms of tonsillar hemorrhage and to facilitate primary union and to anticipate in some measure the objections that may be urged thereto.

The first step is to determine, definitely, that a certain objective is to be attained, and the second step is to work out by experience and unremitting care the details of the methods by which this objective may be most satisfactorily accomplished. I am thoroughly convinced that primary union in tonsil wounds, as in all other wounds, will secure the safest, the quickest, and the most satisfactory final result in the vast majority of all cases.

Then what are the measures which will best enable us to achieve this end? I am frank to confess that this latter problem encounters many difficulties which will challenge our best endeavors and will offer opportunity for much future study and clinical investigation. At this time I can only present the conclusions of my own experience with an honest analysis of the factors involved. In the beginning I must say that no invariable rule seems applicable to all cases, but the surgeon, necessarily, must modify his procedures to meet the indications as they arise. There are, however, certain fundamental principles that underlie success and must at all times be kept in mind.

First: The field of operation should be rendered as clean as the circumstances will permit. It will be said in this connection that you cannot get the throat into a perfect aseptic condition.

Quite true, but the same thing applies to all operations on mucous surfaces in general, and no one would, on this ground, contend for negligence in operations on the eye, the mouth, the nose, throat, bladder or perineum. It will be said that in the enucleation of the tonsil much septic material is squeezed out of the crypts and this infects the field. This is admitted, but the infectious matter can be mechanically removed in various ways, and the general mucous surface, at least, cleansed by dependable antiseptics as is done in other parts of the body.

Second: The coaptation of the denuded surfaces should be complete and accurate. This is probably the feature most likely to be disregarded and the one most important to be observed. There will be a tendency to simply loosely approximate the faucial pillars, but this is perfectly useless and surgically unsound. This would only cover the wide gaping tonsil fossa from which indefinite bleeding might steadily ensue unobserved, distending the tissues as a hematoma or passing silently into the stomach to be vomited up in such quantities as to alarm the patient and his friends with the possibility of serious consequences. It would also effectually prevent any possibility of primary union and would correspond in surgical efficiency to approximating only the skin wound in abdominal incisions or in perineorrhaphy. To some extent the objections would apply to the procedure of sewing up a gauze sponge in the tonsil fossa, which might have some influence in controlling immediate hemorrhage, but would give no protection against secondary hemorrhage, and would render primary union impossible.

The essential feature in the process of coaptation consists in the introduction of the sutures in such a way as to entirely close up the artificial tonsil fossa when the threads are tightened and tied. In fact, all dead space must be eliminated just as completely as is done in the abdominal wall or the perineum.

Now the exact method of accomplishing this result will depend upon the circumstances of the case, the size and character of the wound resulting from the tonsillectomy. Let us consider, for example, some of the well recognized operations for tonsil extirpation and the special procedures for closing the wound that would be indicated in each. It will be remembered that I am not now discussing the operations for removing the tonsil but rather what we shall do with the wound after the removal has been successfully completed.

To begin with, take the simplest form of tonsillectomy that we would perform, an uncomplicated case of a child under gen-

eral anesthesia. Many of these children are frail and anemic and have no blood to lose or nervous energy to throw away. They are entitled to an operation which is practically bloodless and that permits them to eat and drink without delay. In such a case, if you employ the LaForce modification of the Sluder instrument, you can introduce your sutures, while the crushing blade having been driven home is compressing the artificial pedicle but, before the cutting blade has excised the tonsil. Ordinarily two sutures will be sufficient and they can be effectively introduced as follows: Pass the upper needle through the palato-pharyngeus, the superficial fibers of the superior constrictor and out through the palato-glossus, keeping close to the instrument holding the tonsil pedicle in its grasp. The path of this suture should be about three millimeters below the upper border of the instrument, and the path of the lower suture should be about six millimeters above the lower border of the instrument. The threads are then loosely tied in a triple knot and then the cutting blade is made to advance, completing the excision of the tonsil. Then the instrument is entirely removed and the knots immediately tightened before the slightest particle of bleeding can take place. These sutures will generally prevent any gaping of the wound, but if there should be any tendency to gape an intervening suture can also be introduced. When the sutures are introduced in this way, so that they hold permanently in contact the opposing raw surfaces pressed together by the instrument, we have the ideal conditions for primary union. We have the most complete and perfect coaptation that could be desired, without the intervention of any temporary bleeding to separate the tissues we wish to unite.

In the event you do not use the La Force instrument but prefer the original dull Sluder, you can insert the sutures in exactly the same way just before the final pressure severs the attenuated pedicle. In the event you prefer the Beck snare or any other form of snare, your compressed pedicle, instead of forming a vertically placed curved line, is reduced to the form of a cylindrical cord and your sutures can then be introduced so that the upper one passes through the upper margin of the pedicle, and the lower one through the lower margin of the pedicle. In the event the enucleation is performed entirely by dissection so that you have a gaping fossa, and in every case where such a condition obtains for any reason, the important thing to do is to secure an obliteration of the fossa. This is accomplished by grasping with artery forceps the fibrous lining of the fossa and bringing it forward flush with the pillars of the

fauces, and then passing the sutures through the palato-pharyngeus, the superficial fibers of the superior constrictor, held by the artery forceps, and out through the palato-glossus. This process should begin at the dome of the fossa and should be repeated for as many sutures lower down as the circumstances of the case might require. Instead of grasping the fundus of the fossa with artery forceps and bringing it forward so as to make it easily included in your suture, the needle can be made to describe a semicircumference encircling the walls of the fossa, so that when the threads are tied the raw surfaces are approximated very much as the threads are passed in the operation of perineorrhaphy.

It should be remembered that nature never made an open tonsil fossa. Man is the originator of this condition and some laryngologists seem to worship it as a fetish. The palato-glossus is composed of a very thin band of nonessential muscle fibres covered by a redundant fold of mucous membrane, and this redundant elastic fold of mucous membrane lends itself beautifully to the purpose of covering over the denuded tonsillar fossa, somewhat as the elastic bulbar conjunctiva lends itself to the purpose of covering over the denuded sclera after a pterygium has been separated from the globe. It is important that the open tonsil fossa shall be closed up by the approximation of contiguous muscle tissue, and covered over by the apposition of the available mucous membrane. The sutures should be interrupted and only in sufficient number to properly close up the wound. The material should be of the most absorbable catgut, 00 size, and may be left in situ for complete absorption, especially in children, or they may be removed entirely or in part after 24 hours, when adhesive inflammation will have been well established.

In adults the removal of the superior sutures will add to the comfort of the patient without militating against primary union, which is an object worthy of our diligence and care. If you should fail to properly apply the sutures or use an insufficient number to perfectly control the bleeding, a most marvellously successful procedure consists in the injection into the subjacent tissues of a weak solution of novocain which immediately does two things; it renders the patient more comfortable, and by the artificial edema thus produced it perfectly controls the oozing which may attend the reaction.

There is one other thing which will help materially to render the operation more satisfactory, and that is the applica-

tion to the wounded area of a powder composed of aspirin, orthoform and lactated pepsin in equal proportions. This combination will instantly mitigate the pain and hasten the solution of the suture material after its mission shall have been accomplished. Of course the application of various antiseptic solutions to the throat will prove both gratifying and effective, and when convenient to do so, the patient should be under observation for the period of healing, just as in all surgical procedures upon members of the human race.

## RELATION OF THE DISEASED TONSIL TO FOCAL AND GENERAL INFECTION

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In the last twelve years the operation of tonsillectomy has replaced the older operation of tonsillotomy. Within that time enormous numbers of tonsils have been removed for various causes and conditions. The country is literally flooded with laryngologists, many of whom are half baked, as it were, as revealed by the examinations conducted for army classifications, during the late war, who are removing tonsils without fear or favor, and with but little regard to the welfare of the patient. However, there is yet left a remnant, like the remnant in ancient Israel, who have not bowed the knee to Baal, the Baal of greed as it were to-day, which is conscientious in this line of work. These men and women will not perform any operation primarily for gain. Many of these have put on record the results of their work, and thus a vast literature has been accumulated upon the subject of tonsillectomy. We are now able to do what we have not been able to do before—trace out the possible connection between diseased tonsils and certain conditions which are found to be cured or markedly ameliorated by complete tonsil extirpation.

Of course in a discussion of this kind, the simultaneous removal of the adenoids is considered a part of the operation of tonsillectomy, especially in children, if adenoids are present.

Even yet, sufficient literature has not appeared upon this important subject to warrant us in drawing any hard and fast conclusions as to the relationship of chronically diseased tonsils to general systemic infection. Nevertheless, we are justified in drawing valuable conclusions from this accumulated literature, as well as from our own individual experiences.

While this vast literature has been accumulating during the past dozen years, comparatively few articles have been published dealing with the subject of the paper, and fewer still are the articles dealing with reflexes caused by diseased tonsils. Hence any further contributions dealing with either of these two phases of tonsillectomy results will be very welcome to internist and laryngologist alike.

Taking the Laryngoscope's most excellent and unusual Index Medicus and Digest of Oto-Laryngology as the basis of our search, we find the following to be true:

For the year 1909 there were published 58 articles upon the tonsil. Eleven of these deal with infections caused by diseased tonsils, and almost all with the relationship of the diseased tonsil to tuberculosis.

For the year 1910, 95 articles appeared, of which 17 deal with the infection relationship.

For the year 1911, 110 articles were published, of which 26 deal with this phase of the subject.

For the year 1912, 115 articles of which 22 are upon infection relationship. In this year appeared MacKenzie's article upon the "Massacre of the Tonsil."

For the year 1913, 135 articles were published, of which but 17 deal with this relationship.

For the year 1914, 111 articles and again the small number of 14 are upon this subject.

For the year 1915, 115 articles, and only 14 on this subject.

For the year 1916, 85 articles, and the largest proportion to that date, for 25 appeared to trace out the diseased tonsil as the cause of distant and focal infection.

For the year 1917, there appeared 107 articles, and 27 deal with the question of infection.

For the year 1918, 80 articles were published, with 20 on infection.

For the year 1919, 88 articles, with 15 on this relationship.

For the present year, 1920, according to the Quarterly Cumulative Index of the American Medical Association, 44 articles have appeared to July first of which only four deal with the infection relationship.

Thus to date, there have appeared 1,085 articles on the tonsil, the great bulk of which relate to operative procedures and their postoperative effects or immediate consequence like hemorrhage, etc. Out of this vast literature, but 205 deal with the relationship of the diseased tonsil to toxic infections and reflex effects, or about 18.9%. We wish that the proportion were greater.

Nevertheless we are surprised to learn that the tonsils have been removed for the cure of such a very large number of conditions, and we wonder, if in their zeal, reporters have not stretched the truth a little, in tracing out mythical relation-

ships of diseased tonsils to infection, which others seem to be unable to so trace.

Yet anyone with a large experience with tonsil work, has seen some of the conditions enumerated below benefited by tonsil extirpation.

According to this literature, tonsils have been responsible for the following conditions which I have endeavored to group and classify thus:—

Genito-Urinary group:

- Acute nephritis.
- Pyelocystitis.
- Albuminuria.
- Paranephritis.
- Acetonuria following Quinsy.
- Orchitis

Arthritic group:

- Septic infection of the joints.

Rheumatic group:

- Neuralgias.
- Lumbago.
- Perineuritis.
- Myositis.
- Tenosynovitis.
- Sternomyelitis.
- Indurative headache.

Cardio-vascular group:

- Acute myocarditis.
- Endocarditis.
- Phlebitis.
- Leukemia, acute.

Eye group:

- Iritis.
- Choroiditis, focal.
- Optic neuritis.
- Retinitis, hemorrhagic.
- Paralysis of accommodation.

Ear group:

- Otitis media, nonsuppurative.
- Otitis media, suppurative.
- Gradenigo's syndrome.
- Disturbances of equilibrium.
- Earache.



## Pulmonary group:

- Tuberculosis.
- Secondary pleurisy.
- Bronchopneumonia.
- Asthma.

## Gastro-intestinal group:

- Gastric fever?
- Ulcer of the stomach.
- Appendicitis.
- Recurrent vomiting.
- Jaundice.
- Pyorrhea alveolaris.

## Glandular group:

- Splenic infarction secondary to phlegmonous peritonitis.
- Cervical adenitis, tubercular with abscess.
- Parotitis.
- Goiter.

## Infectious disease group:

- Influenza.
- Scarlet fever.
- Diphtheria.
- Measles.
- Poliomyelitis.

## Nervous disease group:

- Chorea.
- Hemiplegia.
- Meningitis.
- Recurring encephalitis and meningitis.

## Septic group:

- Septicemia.
- Severe sepsis.
- General infection.

## Miscellaneous group:

- Skin lesions.
- Syphilis.
- Bad breath.
- Temperature increase.
- Bad dental arches.
- Voice disturbances.
- Aprosexia.

This is surely a formidable array of diseases chargeable to the chronically diseased tonsil. Can it be possible that tonsils are unnecessarily removed? A great many believe that it is a case of "get the money."

I should hate to believe it so.

However, the other side is to be considered for the following sequelae are reported as the result of tonsil removal:

Basedow's disease.

Pains in the stomach?

Speech disturbances.

Acute myocarditis.

Suppurative joint trouble.

Lung abscess.

Hyperplasia of the peritonsillar gland.

Injury to the singing voice.

Death.

Some of these sequelae would have occurred had the tonsils not been removed.

At this point I wish to direct particular attention to lung abscess following tonsil extirpation. It really is becoming too common. Bossum reported a case in 1913, possibly the first case published. Then Scudder and Manges in 1916. Clendenning blames the trouble to the motor driven ether and suction apparatus.

According to Cutler and Hunt in the July number of the Archives of Surgery, one patient out of every 30 to 50 operated upon develops lung complications, and one in every 150 to 185 dies from such complication. They believe that pneumonia, pleurisy, bronchitis, empyema, lung abscess, or fatal pulmonary embolism may occur and that preexisting tuberculosis may show exacerbation.

According to Hedblom the symptoms may not show for a period of months or years, and no immediate symptoms may be present. Cutler and Hunt believe that the cause lies in embolism from the operative field. Whipple is of the opinion that inhalation anesthesia on top of a preexisting lung lesion may in some cases be the factor.

Burgen has reviewed the literature since Manges' report in

1916 and believes that blood borne infections are common. Incidentally he advises more care in preparation for operations, and that the patient must remain in bed for several days following operation. He advises local anesthesia for older children and adults and in young children, great care in general anesthesia. Every care must be taken against aspiration of foreign material into the lungs.

Lung abscess occurs in one out of every 781 cases.

I have had one case of lung abscess following tonsillectomy.

I have one case wherein after tonsillectomy a severe infection of the right knee joint developed, for which I wished that I had had for use an autogenous vaccine prepared from the excised tonsils. However, the case resolved beautifully without surgical interference. It may be good practice to make a culture from every pair of tonsils removed so that an autogenous vaccine may be quickly prepared for use when needed.

It has been my misfortune to have lost a case from diathesis hemorrhagica after tonsil removal. Had we taken the coagulation time prior to operation, this distressing accident need never to have happened. Deaths after tonsil extirpation have been reported by Gabbett, Lillie and Lyons, and Panse. The last report of the New York Postgraduate Medical School on tonsil work shows that in the last three years four deaths have occurred, following tonsil extirpation; the report adds "that is not many." But one death is enough to shorten by several years the life of one so unfortunate as to have one occur in his practice thus. It is a complication to be feared and avoided if possible.

The paper of Layman before the 1917 meeting of the American Laryngological, Rhinological and Otological Society is of great value in this connection for he communicated with internists as well as laryngologists, to ascertain the "Results Obtained by Tonsillectomy in the Treatment of Systemic Disease." I have taken the liberty of retabulating his figures so as to be able at a glance to take in the actual situation, as to the prognosis.

Layman's Collection of Figures on Cases Reported to Him.  
Retabulation of the case reports: Systemic diseases.

	Real Cures.	Improvement	Negative
Arthritis .....	262	184	14
Cardiovascular .....	3	25	4
Renal .....	21	12	4
Rheumatic group:			
Neuralgias, lumbago, etc.	220		3
Chorea .....	3	17	
Cervical adenitis .....	57	51	12
	<hr/> 566	<hr/> 289	<hr/> 37

Total, 891.

Following tonsillectomy what cases developed the following:—

Acute exacerbation of systemic disease:

Arthritic .....	10
Goiter .....	1
Postoperative low grade infection.....	9
Nasal sinus trouble .....	49

Total .....69

In other words as the result of the investigations conducted in the papers referred to above we find that there is an undoubted connection between infections and diseased tonsils, of which the latter are the causes. Further, the evidence seems to show that tonsillectomy has a distinct therapeutic value in curing or alleviating many of the diseases enumerated.

I cannot go as far as some who advocate the removal of tonsils and adenoid masses as a prophylactic measure, though of the latter stand I have been covertly accused, because once in an institution over which I happen to be oculist and laryngologist, I removed the tonsils of forty-eight children out of 150.

Therefore, we will continue to remove tonsils and adenoid masses for the following reasons at least:

- (1) To remove obstructions in the breathway.
- (2) To remove focal infection.
- (3) Preparatory to the correction of bad dental arches.
- (4) To cure aprosexia.

But we would not be true to ourselves and to our patients if we regard the tonsil as the sole portal of infection. We must be physicians first and laryngologists next. Therefore, before

removing tonsils, it becomes our bounden duty to search for possible existing foci elsewhere, for the following organs may be the cause of infection or reflexes, and unless corrected tonsillectomy will be disappointing:

The teeth.

The accessory sinuses of the head.

The gall bladder.

The gastro-intestinal tract; the appendix.

The bronchial glands.

The lymph nodes.

The lungs for tuberculosis.

The eyes.

In fact a complete examination of the patient should precede tonsillectomy. If the examination shows no other focus of infection or a reflex, then we may confidently expect that tonsillectomy will cure the trouble which the tonsils are causing in 60% of the cases, that benefit will accrue to 30% and that no result will be expected in 10%.

The patient may have reflex disturbances which have no connection with infection whatever. As ophthalmologist also, I wish to call attention to quite an array that one meets with due to eye-strain. The correction of the refractive errors causes such to disappear. Many such cases have been advised to have the tonsils removed and if the advice has been accepted the disappointment that the patient suffers is quite acute, until the refractive error is corrected, together with the error in the external muscles of the eye.

In conclusion, may I add that the operation of tonsillectomy should be as bloodless as possible, especially in children. Too often these little folks leave our hospitals looking like little corpses from excessive loss of blood at the time of the operation. Some operation eliminating dissection if possible ought to be employed; then all bleeding points should be clamped and tied just as the general surgeon does in the presence of hemorrhage.

#### DISCUSSION

DR. JOSEPH C. BECK, Chicago: I am very glad that Dr. Clendenning of Kansas City is present. I have invited him to come and help us in the discussion of such a vital point as lung abscess. In opening the discussion I wish to congratulate the essayist and the academy on the wonderful presentation of the first paper on the circulation of the tonsil. I cannot speak as an anatomist on this subject, but purely from the clinical and histopathologic point of view.

I have made a number of sections of tonsils and have studied histologic anatomy in that way.

One of the most interesting and important points in the paper is showing us that the plica triangularis is not a mucous membrane fold, as we formerly thought, but that it contains mostly lymphoid tissue. I wish the doctor would tell us whether in the sections he examined it contains any lymphoid tissue which contains crypts lined by epithelium, or whether it is of the same type as the lymphoid tissue at the base of the tongue.

We are all interested in the recurring tonsils, a thing that is bound to cause much confusion in the examination of our own cases and in the cases getting into the hands of other men who must see these masses. This subject was so thoroughly discussed at the last meeting of the American Laryngological Society that I wish simply to call your attention to the matter. Should this tissue, the plica inferior, be removed in connection with the operation? It would at once become clear to you that the original operation, namely tonsil dissection would naturally become the best operation, because going in with the Sluder instrument or any of its modification, would leave the plica, a great part of it, and we would have to do a secondary operation. Even at that, I do not think any operation can be so smoothly performed as with the Sluder instrument, or other instruments on that principle.

As to the arterial blood supply, on which Dr. Gordon Wilson and others have written, they mention the meningeal branch coming down and supplying this upper part of the tonsil. In my experience I have found in retracting the pillars with a forceps and trying to find the blood vessel that we were shown, that it comes from the lingual and that it is an inconsequential artery.

I am glad to learn of a more rational anatomic nomenclature instead of supratonsillar fossa; and then the position of this tonsil as it really is and as we see it when the mouth is opened. If you take the Hays pharyngoscope, which is not often used now, you can see the tonsil, as was told to us by the reader of the paper, that is looking backward.

The points that interested me in the other papers; first I wish to say that I am always glad to hear Dr. McReynolds read a paper. The last time, when I heard him make a brief presentation of this operation of sewing up the pillars, I was in doubt as to its efficacy. I went home and tried it and am not ready yet to say that it is a good thing. I do not wish to say more, for as he read the paper today it seems that I have not conformed entirely to the technic. I would like to ask Dr. McReynolds if in the ligation of these sutures he interposes anything, such as a piece of rubber or gauze, and if not, does he get decubitus from the ligatures if they are tied tight enough to shut off the circulation.

Now about lung abscess. Gentlemen, I have never had a lung abscess following tonsil operations. I will repeat the word never a lung abscess or any such complication as pneumonia, general sepsis or even marked local cellulitis, clinical or otherwise. I am accused of having brought forward an instrument for vapor anesthesia and

suction that has produced such complications. If that instrument can be blamed and can be proven for that occurrence we want to stop using it, for we can develop our local anesthesia and other means of general anesthesia and get away from it. I want to answer Dr. Clendening after he makes his statements so that we can get this thing cleared up.

Dr. Keiper's paper is full of things for discussion. He missed oto-sclerosis as one of the things that has been reported as due to the tonsils and several other conditions, or perhaps he mentioned them and I did not get them.

DR. W. V. MULLEN, Colorado Springs, Colo.: One's first tendency it seems to me would be to condemn this procedure of Dr. McReynolds when you read the title, on the grounds that the action of the two muscles sewn together are different, and yet in talking with Dr. McReynolds privately, he has told me of his results in his cases, and that is the proof and after all it is results that we want. I asked him particularly as to injury to the voice, both singing and speaking, and he tells me he does not have it. I asked him about scar formation and contraction and he tells me that is satisfactory. That takes you back to a statement made by G. Hudson Makuen some years ago, and that was to the effect that there was no standard for the voice, it is just as you hear it; what may seem to be an imperfect voice to one may not seem so to another. I am not criticising Dr. McReynolds' ear. I wish Dr. Poynter in closing would give us his opinion as to the palato-glossi and palato-pharyngei and whether he thinks their actions are very different.

The ideals that I have had in after results in the tonsil operation have been to strive to have my pillars stand apart just as they did prior to the operation and I do everything in my operation to lead up to that result. I remain just as close as possible to my tonsil in the superior tonsillar fossa in separating the mucous membrane from the tonsils, letting that fall back into the fossa, and I have felt by being careful that I do get enough of the pillars remaining apart afterwards to warrant my being very careful in the procedure.

Dr. Kenyon, of Chicago, in examining 161 cases picked up more or less at random, has made some very interesting observations regarding injury to the voice after the pillars have been injured, or removed, or scar formation taken place. I wish Dr. McReynolds would tell us in what percentage of his cases he gets primary union.

As to bleeding, I feel must better satisfied when I have a ligature around a vessel either venous or arterial, such as Dr. Poynter has shown in his plates, rather than relying on the sewing of the pillars together. Taking a small, round, curved perineal needle and a curved hemostat and putting the needle in the hemostat in the same position as the curve of each, rather than grasping it across the needle as it is held with most needle holders, will enable one to change the angle of the needle, depending on what position in the tonsillar fossa the spurter or bleeding point is located. The lower pole is the most likely to give you concern in bleeding, and likewise is the hardest place to tie a vessel.

As to Dr. Keiper's paper, I feel that if lung abscess is due to

the tonsil operation, it is a disgrace. I am not saying that they do not occur, for we know that they do, but if it is due to the tonsil operation alone it would mean either carelessness, or that had the chests in these cases been carefully examined beforehand, they would have shown trouble which would have indicated that perhaps just at this time it would have been much better not to give that patient a general anesthetic, and that the anesthetic only started up trouble. Also, it must not be forgotten that diseased tonsils are very often the cause of disturbances in the chest.

DR. JAMES J. KING, New York City: I am sure we are glad to have heard Dr. Keiper's paper. The great trouble with the paper was that he did not have time to mention all the possibilities of a tonsillar infection (laughter)

I wish to call your attention today to some other factors and supplement what Dr. Keiper has said in his paper. In the first place, I believe we would be better off if we did not consider the tonsil alone and expect its removal to clear up disease, but looked upon it as a part of the body, and in order to remove all infection realized that we must not only remove the tonsillar infection, but the other foci of infection as well, if we are to obtain the best results.

Another thing, I wish to take exception to the author quoting, or blaming, the suction apparatus, the motor driven ether-vapor apparatus. We have operated upon a great many tonsils in New York City and we have used the suction apparatus and the vapor apparatus for the administration of ether for many years, and we have never had a lung abscess or any serious complication. I think that it is a factor that makes for safety instead of danger. When some of the pus material is squeezed out, the suction apparatus can immediately take it up and get it out of the way.

One thing has been brought out in recent years which has a very important bearing on this subject. The work of Pilot and Davis has proven that the high mortality in measles, whooping cough, pneumonia and such diseases has been due to a latent infection in the mouth, and that it was not an acute disease which caused the mortality but the streptococcus viridans assuming greater virulency through symbiosis and terminating fatally diseases which should not terminate fatally. We can have this increased activity in several ways; first, through a symbiosis of this organism with other organisms; second, a decreased resistance on the part of the host, so that he cannot withstand these diseases. It is not necessary to try to call attention to all the diseases that may be due to focal infection. I think this has been proven now, both scientifically and experimentally, but it is only within the last ten to fifteen years that the medical profession has accepted these facts. But now, wherever progressive medicine is practiced, this fact is recognized and the literature is abundant showing where men have proven it scientifically. All departments of medicine and surgery are teeming with literature regarding the eradication of foci of infection. In eradicating foci of infection it is essential to remove all infection, ignoring which one is the instigator. That is the great point that we must remember in this connection. I would like to show you very quickly a few lantern



slides that will demonstrate some of the points of infection. (Exhibits lantern slides.)

Getting money is not an indication for removal of the tonsils (laughter). Two things are essential: one is to relieve the patient of his infection, and second, to get a good looking throat. The muscles should be left intact and the two sides should be symmetric, and I think the time is coming when we will all work with the ideal result in view.

DR. JOHN F. BARNHILL, Indianapolis, Indiana: If I understood the first speaker he stated that he did not always find a complete capsule of the tonsil. That was rather surprising because in the Sluder operation it is demonstrable nearly always that there is a complete capsule of the tonsil, provided it has not been seriously and frequently diseased external to this capsule, as in quinsy. There are two types which may illustrate what I mean (illustrating on blackboard). One type in which the lower lobe of the tonsil projects downward like a teat below the insertion of the body of the gland. In this type I have found that the capsule is complete but does not surround any part of the teat. This type of tonsil is most easily and completely removed by the Sluder method.

In the second type there is no projecting, free extremity of the tonsil at its lower pole, but instead the gland gradually subsides and merges into the lower tonsil bed. Such tonsil is not easy to remove by means of the Sluder method for the reason that the lower, shallow submerged pole is not readily engaged in the fenestra and is left behind to be removed by dissection methods, or to grow again and give future trouble. In this latter class of tonsil I have found by subsequent dissection of this gland, that at times the capsule does not seem complete, but is merged into and lost in the substance of the lower pole. It is perhaps this type, and of the extratonsillar tissue of the lower pole that Prof. Poynter states that muscle fibre is sometimes found attached directly to the tonsil.

I wish to ask Dr. McReynolds several questions about possible injury to the throat and to the voice. It has been stated that he has said no such injury occurred. Taking it for granted that injuries do not occur, the type of operation which he describes seems to be based on sound surgical principles, and therefore in the absence of harmful results should become the ideal operation for the future.

Concerning the last paper, especially concerning lung abscess, I cannot under any circumstances condemn the suction and ether apparatus. I believe, as many of us do, that one of the greatest advances in throat surgery has been the Beck apparatus. I think the reason for many lung abscesses is that blood and infection from the diseased tonsils are sucked into the lung by the respiratory efforts of the patient which should by the Beck apparatus have been sucked out. So I consider the apparatus as a safety apparatus rather than a device for danger. I stated some time ago that I never had had a lung abscess, but I did not touch wood as Dr. Beck did just now, and I have had one recently for which I do not know how to account. This lung abscess followed the use of a local anesthetic when no suction apparatus was used. The patient was thirty-three years old, a teacher

in a girl's school, and was in reasonable health except for the throat infection. I sterilized her throat well as I believed possible, and operated on her under local anesthesia, apothecin, in the usual way. There was no bleeding at the time of operation or afterward. I performed the Sluder operation under local anesthesia and there was little pain after the removal. Two days later she developed a temperature, and soon pneumonic symptoms, followed by death in two weeks. Autopsy showed multiple lung abscesses.

DR. LOGAN CLENDENING, Kansas City, Mo.: I am, I suppose, invited to appear before you to discuss the question of lung abscess occurring as the result of operations in which motor-driven anesthesia apparatus is used. I am not an anesthetist or laryngologist; I have been interested as a general medical man who sees these abscesses after they have occurred. The origin of my interest in the matter was the publication of a paper of mine in the *Journal of the American Medical Association*, in which I reported one case of lung abscess in detail, and referred to some others. At that time I reviewed the suggestions as to etiology as they have been made up to the present time, especially by Manges, who reported nine cases in 1916. He stated that all of his cases had been on free services, and he inferred that these accidents did not occur if all precautions were taken care of. He thought the abscesses occurred only in the presence of acute infections, or acute respiratory diseases. One of the objects of my paper was to point out that this was not true. They have occurred after careful operations by careful operators, and in patients who have received every care both before and afterwards. In going over the thing I said that as a cause of them, motor-driven anesthesia apparatus might be responsible. In other words, it may be one of the factors, because I think inhalation of septic material is what produces them. I said the suction feature of the apparatus was a good thing, but that it was the motor driving the ether into the posterior pharynx which might cause pressure and force pus and blood through the epiglottis. Irrespective of what you think of my views, it is a matter of great importance to you. No one can listen to the statements of Dr. Keiper, that so many operative cases have a pulmonary complication, following operation, without acknowledging its importance.

I would like to argue the matter on three points: First, the time argument. The first case reported was in 1913, following tonsillectomy. Since that time I do not know how many cases have been recorded, but somewhere in the neighborhood of 110, all following either tonsillectomy or other throat and nose operations. That period of time is about the period in which these motor-driven apparatuses were introduced. There are no reports in the literature before that and no one has explained away this relationship.

An anesthetist in this city who was, to a certain extent, responsible for opening this discussion, Dr. H. C. Anderson—I am sorry he is not present today—began at about the time of the introduction of these machines to notice that there was an epidemic of respiratory complications following his tonsil and adenoid operations. He is a man who is an internist, a very capable one, and not only an anes-

thetist and, unlike many anesthetists, he goes in to see his patients after the operation and often follows them to their home if there is any complication. A number of people "caught cold" within a few days and some developed pneumonia, and this had not occurred in anything but his nose and throat operations.

Now on the second point. I would like to argue that these things are definitely related to nose and throat operations. I reported one case in detail. I had one other case that followed tonsillectomy in which a motor-driven apparatus was used. I have since seen two other cases, one operated in June, a little girl who has run a temperature of 104° to 99.5° F. ever since, with an abscess in the lung close to the media-tinum. Then following that, I have asked for the report of cases of lung abscess in which motor-driven apparatus was not used, and I have not yet received any cases. It is possible that they could occur without a motor-driven apparatus. Dr. Tewksbury, of Washington, has had nineteen cases. He says half of them followed the use of motor-driven apparatus and the other he was not able to trace. He has never seen a case of lung abscess following local anesthesia. The case that was reported here this morning did not look like a simple abscess but, a generalized infection.

I would like to report one case of very great significance, in a woman who was operated on for tonsil removal and in the afternoon of the day of operation "caught cold" and developed a temperature of 103° F. Nothing was found in the lungs. The next day the temperature was 102° F, and nothing was found on physical examination. Two days later we found a patch of crepitation and dullness on one side. Two days afterwards she was better, the temperature was down, and the nurse told us this improvement was coincident with the coughing up of a clot of septic blood, which she showed us and which was the shape of a small bronchus. This is probably the way these abscesses originate. She was lucky that she got the blood up before it went on to tissue change.

Third, I wish to take up the question of the apparatus itself. It has been explained to me very patiently by a number of people, in print and personally, that these things do not cause any pressure. I may be lacking in intelligence but I cannot see why they are used at all if they do not exert pressure. If they do not force ether vapor into the pharynx and lung what is their purpose?

I think the matter is in your hands. You gentlemen can collect the statistics, but I firmly believe that these things are the cause of most of the respiratory trouble you have after your operations. If not the primary cause, they are a contributing cause and should be watched very carefully.

DR. JOSEPH C. BECK, Chicago (replying to Dr. Clendening): I think my discussion should be continued at this time in order not to duplicate.

In the first place I wish to ask questions: Has Dr. Clendening followed the case that he reported since the time he made the report?

DR. CLENDENING: Yes.

DR. BECK: Does he know that the case has been in Colorado since the time he reported it?

DR. CLENDENING: Yes.

DR. BECK: Does he know that the case has been in the service of Dr. Dennis, of Colorado Springs since then?

DR. CLENDENING: Yes, he did a bronchoscopy.

DR. BECK: I have seen the correspondence of doctors and patient and it says in the report, as you say, that the cough began immediately after the operation, and also in the correspondence it says that there is a shadow in the X-ray suspicious of a foreign body in the lung. Now that is the crux of the discussion. What are these abscesses? Are they due to ether vapor driven by a motor-driven apparatus? Are they due to a blood clot in the bronchi with secondary infection? When we use a suction apparatus, there should be no blood in the lung. We know that. The cases Manges reported were ambulatory, taken in from the street and operated. Whether they had an acute bronchitis before operation is not stated. There was no vapor used at the time Dr. Manges' cases were reported—they did a simple tonsillectomy by the ordinary drop method of anesthesia. What we wish to know is more information on that particular cause. About 1913 the apparatus was introduced. I did not originate it; Drs. Haskins and Yankauer and others employed vapor methods before I did; I simply perfected it.

Another thing, does the ether blow into the lung? Physicists say no. The ether is respired into the lung. It is not as good as the drop method because it is not warm enough. Dr. Carmody's apparatus really warms the ether but ours is not warmed and it does irritate, but it does not blow anything into the lungs. At least Dr. Clendenning has brought nothing forth that has proven that fact.

DR. GEORGE F. COTT, Buffalo, N. Y.: Dr. Keiper has brought out the action of the infection in the lower part of the body, but has not talked about the edema. Two or three weeks ago I was called to open an abscess due to quinsy in a girl twenty years old. I called on the patient at her home and found the jaws partially ankylosed. I could open the mouth just enough to admit a depressor and see the throat. The right side was normal but the left side appeared like follicular tonsillitis. I could not account for the ankylosis but thought it might be due to the cutting of a wisdom tooth. I asked the physician if he had made a smear or culture and he said no. One pupil was dilated three-sixteenths of an inch, the other contracted, neither responded to light, the planter reflexes were absent, no Kernig's sign, neck muscles stiff, and some edema over left sterno-mastoid muscle. There had been no brain symptom the day before.

About the gas-ether we usually give in tonsillectomy, I wish to enlighten Dr. Beck about the ether getting down into the lungs. I operated recently and saw gas bubbling to the top of the bottle I asked the nurse if she ever got ether in the nose and she said "no." I told her to take off the tube and the ether ran out. It could easily get into the lung in that way.

Just before leaving for this meeting I was told by a tuberculosis specialist of four lung abscesses following tonsillectomy, which had recently come under his observation. I think there are many more cases of lung abscess than we know of.

DR. T. S. BLAKESLEY, Kansas City, Mo.: Just a few remarks regarding Dr. McReynolds' paper. Some years ago, and for several years, I closed all my tonsil cases by means of large metal sutures. The sutures were left in place closing the tonsillar fossa for twelve to forty-eight hours, and out of a series of some hundreds I had no bad results. I will say that closure of the tonsillar fossa by this method did not cause any interference with the voice, as far as I was able to find out. Then in the last few years I have been doing the bloodless LaForce operation, both as regards length of healing and after-results.

One point in regard to the discussion concerning the motor-driven ether apparatus that I wish to call attention to. I have used what I consider one of the best machines, the Kellogg apparatus, for a good many years and have had no instance of any chest trouble whatsoever except in one case, and I was fortunate enough to see the apparent cause in that case. After the patient had gone back to bed I stopped in her room to see her. She was lying on her back and getting no air whatsoever. I tipped her over and cleaned out some thick mucus. A few days later she developed some bronchitis, with a little pneumonia on one side, but cleared up very promptly. I believe that the inhalation of mucus in this manner may be the cause of these abscesses, and I wish to call attention to this, for it may not be the apparatus at all, which during the operation keeps the throat clear, but it may be due to the inhalation of mucus after the patient is in bed, and I think it very important for the nurse to keep the patient turned over so that the inhalation of fluids will not occur.

DR. WILFRED HAUGHEY, Battle Creek, Mich.: I just want to very briefly report a case that will help Dr. Beck out, a case of lung abscess following tonsillectomy in which the motor-driven ether apparatus was *not* used.

The patient was a little girl who presented herself at the tuberculosis clinic. An internist advised tonsillectomy and sent her to me. When she came she was coughing but had no fever. She was sent back for reexamination on account of the cough, but the internist told me to go ahead and operate, as she had no fever. I operated under chloroform. There was no dissection and no bleeding; I simply put a snare around the tonsils and took them out. She developed a lung abscess, which was drained and the child recovered.

DR. C. W. HAWLEY, Chicago: I think there are two really serious items in Dr. Keiper's paper. First, the lung abscess and the matter of hemorrhage. Lung abscess I know nothing about for I have never seen one, but I know something about hemorrhage. One case was very instructive. A few years ago I removed a pair of large tonsils from a lady in my office, and had a very uneasy time for more than an hour. It was nearly two hours before I could control the hemorrhage and I afterward discovered that she was of a hemorrhagic type. A couple of years ago she brought her young child to me, and said the first thing, "The child has two large tonsils; you remember what happened to me, so look out." There were the two tonsils coming to the center of the throat. I took the child to the laboratory for examination of the blood and found that it took thirteen minutes for coagulation. I then treated the child for about a year until the

coagulation time was reduced to less than three minutes and then removed the tonsils without any loss of blood. Since then I have asked patients particularly about hemorrhage, and if their wounds heal promptly, and have saved myself from further hemorrhages. I am now being very cautious with every tonsil case that comes to me, especially in children, and have the blood tested for coagulability. It does not take long and while in the past I have sent them to the laboratory I will in the future do it myself, as it is a very simple procedure. If we all do this we will save ourselves much trouble.

DR. A. H. ANDREWS, Chicago: I am not going to give you my experience with lung abscess for fear of the future, as Dr. Barnhill gave his experience, but I believe that if we will take more care with the position of our patients after tonsil operations, and see that for some time they are kept on the face, we will have fewer abscesses. I think all these patients should be kept on the face until they have recovered from the anesthetic sufficiently to take care of themselves and see that nothing gets into the lungs.

We have all taught regarding tonsils, and I am wondering what will happen if the pillars are sewed together as Dr. McReynolds describes. I wish he would tell us. I have had a number of cases where the crypts had been sealed by cauterization and operated later, and I have found great masses of cheesy material. I should be afraid, having even a remnant of a crypt left, to sew up the tonsillar pillars.

DR. J. H. LAXING, Kansas City, Mo.: I wish to speak about the form of anesthesia in two cases that have been cited. One was an abscess without having had ether, and the other case Dr. Barnhill spoke of with local anesthetic, and I will add a case of my own which was not a tonsillectomy. About three years ago I operated on an ethmoid in the case of a woman who had had a pansinnitis and had been operated several times. She had excruciating headache and I found a lot of degenerated tissue in the posterior ethmoid on the right side, which I removed under cocain anesthesia. This was all she had left as the left had been removed. I removed this mass, with immediate relief of her headaches. She had had a cough for some time and had one when I operated. Three or four days after the operation the secretion, which she insisted came from her nose, was very foul. After a few days I found that the secretion was not coming from the nose but she was coughing up this pus. She developed a lung abscess, was operated upon, and died within an hour after the operation. I merely cite this case to show that you can get a lung abscess without the ether anesthesia. Whether the operation stirred up a process that she already had in the lung or whether it was an embolus I am not sure, but it occurred under local anesthesia.

I think from what Dr. Haughey said that we are not sufficiently careful about the condition of our patients when we operate. I have often found that a patient after being in the hospital will develop an acute cold or cough, and I have refused to operate and have sent them home until they recovered. Many times after coming to the hospital they develop something of this sort and the patients don't even tell us about it. Not long ago I asked a patient in the operating room, "How do you feel?" "Pretty good," she said, "but I have a

pretty bad cold which I developed yesterday." She had developed it the day before coming to the hospital but had said nothing about it. I think that if we were more careful to see that our patients are in good condition when they come to operation we would have fewer lung abscesses.

DR. THOS. E. CARMODY, Denver, Colo.: Before discussing the matter of lung abscess I wish to compliment Dr. Poynter upon his paper. As I have done some work in the line of histopathology, I am much interested. The one thing we frequently omit in tonsils, if we are not careful, is the lower lobe, and Dr. Poynter's work proves why we have done this. The lower lobe is developed differently. In rabbits we have the single lobe, but in humans we have the two lobes, and the lower lobe does not fuse with the upper. I am also glad to have him call attention to the fact that there is a great deal of adenoid tissue in the plica.

About Dr. Clendening's case, I bronchoscoped that case and could not find a foreign body, and the roentgenogram did not show it. However, there was something else and that is the draining along the lymphatics. Dr. Mullin has done a great amount of work along this line and has proved that we have a drainage into the lymphatics and down the lung root and I believe that much of the infection goes through the lymphatics. We have a lowered vitality at this time, whether it is due to ether or infection, and we often have a great deal of bleeding, which further lowers the vitality. I believe the cases cited by Dr. Barnhill and Haughey prove this.

I wish also to call attention to the point regarding the position, which I am glad someone mentioned. My patient is placed on the table in a semi-Trendelenburg and I think that and the suction helps a great deal. In putting the patient back to bed the nurse is instructed to keep the pillow back of them so as to keep the patient on the side or on the face. If that is done we seldom have any trouble. I had one patient who developed pneumonia but that was due to the fact that I did not see the patient until half an hour after the operation and then found him on his back in which position he had been all the time. Then he developed an aspiration pneumonia which could not be laid to the apparatus.

I think if you use cold ether it irritates the tissues and lowers the vitality more than when the ether is warmed. You will not have nearly as much trouble if the ether is warmed before using, not simply vaporized but vapor warmed to 105° to 110° at the mouth end of tube.

DR. GEORGE W. BOOT, Chicago: I have never used the motor-driven ether apparatus and have never had a lung abscess, but that proves nothing. We get these abscesses from two causes; one is inhalation of foreign material and bacteria. In that way the motor-driven apparatus is to blame because it makes it too easy to get the patient deeply anesthetized. Nature has placed a guard at the larynx in the laryngeal reflex and when that is in abeyance the foreign material gets in. A second method by which these abscesses develop is from a septic thrombus forming in the venous places around the tonsil, just as a septic thrombus forms in the lateral sinus and in the sigmoid sinus in mastoiditis. In support of this I wish to tell you that one of the

interns at the County Hospital had his tonsils removed by the resident, who was a very efficient operator, and developed lung abscess, but eventually recovered.

DR. L. K. GUGGENHEIM, St. Louis, Mo.: I was particularly interested in hearing Dr. McReynold's paper, and feel that I have a right to differ from him. Two years ago I was very enthusiastic about suturing faucial pillars. After one year, I discontinued the practice except in cases of hemorrhage which could not be controlled with hemostats. I gave the method up because a normal condition does not result following suture. The two muscles should work independently; also the sutures do not hold. In twenty-four to forty-eight hours they invariably cut through a part, at least, of the tissue. My results were never clean healing of the pillars and fossae because of the adhesions resulting.

Dr. McReynolds says you get scar tissue if you do not suture. I cannot understand that. I cannot see how a carefully performed tonsillectomy can result in the formation of scar tissue in the fossae.

I have had cases of bleeding where the fossa was absolutely closed all the way to the tongue, and still the bleeding went on. It is far better to find the bleeding point and control it. In cases of diffuse oozing the suturing is indicated.

As to voice I have never seen a definite disturbance of this function.

DR. A. M. PAINTER, Kansas City, Mo.: I wish to ask Dr. Poynter if he has noticed in his dissections a fold of tissue which extends from the top to the bottom of the tonsil posteriorly, and that the vessels which gain entrance to the tonsil tissue are included between its folds.

DR. H. BAILEY, Springfield, Mo.: First I wish to express my gratitude to Dr. Poynter for cutting the arteries supplying the tonsil from five down to four. I hope by the time another year rolls around he will have reduced the number still further.

I would like to ask Dr. McReynolds whether he uses this method in cases operated under local anesthesia? I am not familiar with the method, but it would seem to me that it would be well to have the fossa as dry as possible before inserting the sutures.

• Along this line I wish to mention a method for removing tonsils under local anesthesia which I have found very useful. After first buttonholing the plica and exposing the capsule, a pair of nasal scissors are inserted and pushed along the tonsil to its upper border. They are then widely opened, exposing the upper and anterior surface of the tonsil. The scissors are then reinserted and forced along to the lower border, and opened in similar manner. A curved scissors is then inserted from above down between the tonsil and the posterior pillar and opened as before. This procedure of blunt dissection frees the tonsil from its bed without bleeding, its only remaining attachment being the pedicle containing the chief blood supply. By making traction on the tonsil this pedicle is exposed and its connective tissue attachment including the vessels is cut through with a cautery knife. The traction insures the throat against any damage from the cautery. The operation is practically bloodless and painless and I have found the subsequent pain to be less severe than with the snare. The method



is especially applicable in cases of high blood pressure, or in cases of chronic interstitial nephritis, also where coagulation is slow. I have never used the method under general anesthesia, but I imagine the added bleeding under ether would tend to cool the cautery point too rapidly to make it effective.

DR. OTIS ORENDORFF, Canon City, Colo.: In regard to the control of hemorrhage, I have a method which I use under general anesthesia, and am trying it for local. There is always the danger of hemorrhage which may be very serious, and while it may occur at any time, from immediately until the tenth day, it usually happens during the operation and may be absolutely stopped in a very easy and simple manner, the technic being essentially that of the clamp and cautery operation for hemorrhoids.

Under good illumination and with the anterior pillar retracted by an assistant, make firm pressure with a gauze sponge held in a mouse-tooth tonsil forcep in the usual manner; then remove the sponge quickly and grasp the bleeding point with another forcep in the ordinary way, which when released will nearly always stop the bleeding. If it does not, then repeat the process and before taking off the hemostat raise the tissues well out of the fossa, and use the second forcep as a clamp by grasping under the first forcep at right angles to it and parallel to the long axis of the throat. Now take off the first forcep and heat it to a dull red and sear the mass projecting above the forcep serving as a clamp, which is at once removed and the operation is ended.

When operating under ether, I stop the anesthetic, but am informed that this precaution is unnecessary, as ether will not ignite from a cautery. To be safe, I have a third forcep, or a small cautery iron, (or an electric cautery might be better), heated by a nurse outside the operating room in order to be certain that the ether fumes cannot come in contact with the flame. This method requires no extra instruments excepting an alcohol or gas flame, which is always at hand around an operating room, and it is so simple that I wonder I did not think of it before.

A MEMBER: I have found from experience that ether will ignite from a cautery.

DR. OTIS ORENDORFF: Thank you. It is always better to be safe than sorry.

DR. H. B. LEMERE, Omaha, Nebr.: I think there is a possible valid objection to the ether blowing apparatus when used with the double nasal end piece. I use Dr. Beck's apparatus and for the administration of the ether I use one of the long tubes usually used for suction purposes, which conveys the ether vapor well back into the mouth. Many cases of adenoids and tonsils have a suppurative nasal catarrh, and theoretically at least the double nasal tip might encourage the inhalation of pus.

DR. W. M. C. BRYAN, St. Louis, Mo.: I have been using the Sluder method of tonsillectomy for a number of years and for a time was troubled by the accident of occasionally missing the lower pole, until one day I watched Dr. Sluder himself, and my attention was drawn to the tongue depressor which he uses. It is an unbending, flat,

steel tongue depressor which makes it possible to depress tongue so that a clear view of the tonsillar region is easily obtained. There is then no difficulty in placing the fenestrum of the tonsillotome over the lower pole.

As to lung abscess, that is an occurrence which we must all dread. At Dr. Sluder's clinic, gas anesthesia has been used for many years, during the last five of which I know there has been no case of lung abscess, secondary to tonsillectomy, and I have heard of no cases in the years previous.

DR. HUGH MILLER, Kansas City, Mo.: My good friend Dr. Clendenen's argument that the motor-driven apparatus causes lung abscess or complications reminds me of the man who undertook to run his boat by putting a fan in the rear of the boat. (Laughter.) When one realizes the very slight pressure of the ether in comparison with the suction, we understand why there is so little trouble.

The position of the patient is important to avoid lung abscess or lung complication. The head must be in such position that inspiration will not carry infectious material into the lung. There should be no spasm of the breathing apparatus. I have had one case of lung abscess in my experience and think I can very readily explain the cause of it. A young woman without teeth in the upper jaw was being operated and I was not using a Jennings's mouth gag. The one I had slipped out two or three times during the operation, thereby delaying the removal of blood from the throat. I think in the cases where there are no teeth to hold the mouth gag, it is important to use the Jennings apparatus.

DR. C. W. M. POYNTER, Omaha, Nebr., (closing discussion): First I wish to thank you for your kind treatment after I inflicted so much time on you. I am sorry that Dr. Beck has exposed my ignorance regarding lymphoid tissues. I have been working on it for five years and know much less than I thought I did in the beginning. The question was whether the tissue in the plica triangularis is of the same type as in the rest of the tonsil. So far as I can tell it is exactly the same. Whether later on there is a transition into some other form I do not know. I avoided saying that the lymphoid tissue developed there. My private opinion, however, is that it develops *in loco*, but my experience is not enough to put this out in a formal way.

As to whether one of the embryonic tonsillar arteries develops from one of the arteries which come over from the anterior or posterior pillars I do not know. We will necessarily get variations of that kind. You will get pillar hemorrhage from the lingual or descending pharyngeal, but which one I do not know. I am inclined to think it is most frequently the descending pharyngeal, but the next group that I dissect may change my opinion.

I did say that I did not find a capsule in any case. I can say the same thing about the fascia in many parts of the neck; and will defy anyone, if he employs the study of sections, to demonstrate a fascia. Until you do a dissection, these layers do not drop into line, and a fascia is not appreciated. I am not alone in this for it was brought up first by the English school. Practically, when you do a dissection of this kind you do get a capsule. If the areolar tissue is extensive

blood vessels break up in it before entering the tonsillar body, while if the areolar tissue is thin, relatively large trunks enter the tonsil before branching. This explains the vascular variations in relation to the capsule, if you wish to call such areolar tissue a capsule which I am perfectly willing you should do.

DR. JOHN O. McREYNOLDS, Dallas, Texas, (closing discussion): I wish to say that I appreciate the general discussion of this very imperfect paper. It is not the easiest thing to close the tonsillar wound in a perfect way.

Regarding hemorrhage, I do not think it would be wise to fail to grasp any bleeding point. Settle that point before you close up any wound. I take it for granted that all bleeding points will be closed, and if you are using the LaForce modification of the Sluder there are no bleeding points to be tied because it is practically a bloodless procedure.

Dr. Guggenheim reports that he had some bleeding after closing the tonsillar wound. The probabilities are that he had tried every other means before resorting to the suturing that finally stopped the hemorrhage. But I stated in the paper that if you have oozing the injection of novocain will produce an artificial edema which will stop the oozing, and then if necessary you can introduce additional sutures which will give you further assistance. Two of the gentlemen spoke of using extensively metal clips, and one spoke of using sutures. Both stated that they had not observed any interference with the voice or with the functioning of the muscles. It is an academic question as to how much influence the palato-glossus will have on deglutition. Experience shows that it becomes merged finally, with the superior constrictor in a large proportion of cases.

DR. GEORGE F. KEIPER, Lafayette, Ind., (closing discussion): It is a matter of regret that I could not have presented all my paper, the inexorable time limit forbidding. Hence I took the liberty to lift out of that paper the section on "The Tonsil as Related to Focal and Distant Infection." It was my hope that in a symposium of this nature, we might settle some questions yet unsolved. In fact in this very large representative society problems of this sort ought oftentimes to reach satisfactory conclusions, so far as present conditions are concerned at least.

In the main I will not attempt to answer each discussant individually as that will incur needless repetition, but will reply in a general way mostly.

The discussion has turned largely on the lung abscess phase of the paper. The point that I desire to emphasize is this: The general surgeon gets postoperative lung abscess more frequently than do we. The paper of Cutler and Hunt is a general surgical paper from the standpoint of the general surgeon. The explanation given by them as a cause will probably apply in tonsillectomy work. The lung abscess is no doubt due to embolism borne by the blood to the lungs from the operative field. The motor-driven suction and ether apparatus is not to be blamed therefore. Lung abscesses are bound to occur in anybody's practice, even when a local anesthetic is used as in the case cited by Barnhill.

Can anything be done for its prevention? We should at least be careful enough to insist that the patient be in the pink of health if possible before tonsillectomy is attempted, that he or she may be able to withstand the assault of such an embolism, for it would seem impossible to prevent the embolus from forming and getting into the circulation.

Personally, I use the suction and ether apparatus of Beck and would not be without it, though with later methods of operating, as with the Beck-Schenck snare so little blood is lost as to make the operation practically bloodless, eliminating the necessity for the apparatus.

May I say in reply to Dr. Cott, that the delivery tube for the ether is not to be put in the nose, but in the corner of the mouth, and the ether that comes through it is to be invariably warmed.

Promise nothing in tonsil operations, except to do your best for the patient, for the tonsil cannot always be considered to be the sole cause of the patient's trouble. We are in the same position as the general surgeon, and he is wise not to promise or guarantee results.

Dr. James A. King has beautifully emphasized the value of culture plates in suspicious cases, whereby he may demonstrate to all concerned the germ probably at the bottom of the trouble the patient has.

The postoperative posture of the patient is a point well taken by Dr. Andrews. The patient should always be on the side, or face, for several hours following the operation, and in constant charge of a nurse until all danger from postoperative hemorrhage is past.

In fact the immediate control of hemorrhage is very important. The patient should always leave the operating table with a dry throat. It is my own practice to clamp and tie all bleeding points. That is the method of the general surgeon and he seldom has postoperative hemorrhage.

The crux of the whole matter of prevention of postoperative trouble lies in a complete examination of the patient preoperatively. With all this before the physician, one ought never to operate upon one showing a temperature, never upon one having a cough, and never, never, upon one showing delayed coagulation of the blood.

Personally, I wish to thank Dr. Poynter for the admirable presentation of his subject, and likewise Dr. McReynolds for his splendid method of dealing with the tonsil wound. And finally we who have participated in this symposium would be very unappreciative if we did not thank the very large number of the fellows who remained over to hear these concluding papers of the program and for the interest manifested in them by the very liberal discussion bestowed upon them.

All of this demonstrates that the tonsil question is as of old a very present one, and interesting in the extreme.

## PRESENTATION OF INSTRUMENTS

### LANTERN AND FOLDING STAND

W. D. BLACK, M.D.

ST. LOUIS, MO.

Dr. W. D. Black presented a lantern which shows nothing exceptionally new, except the strength of the lamp and a folding stand which

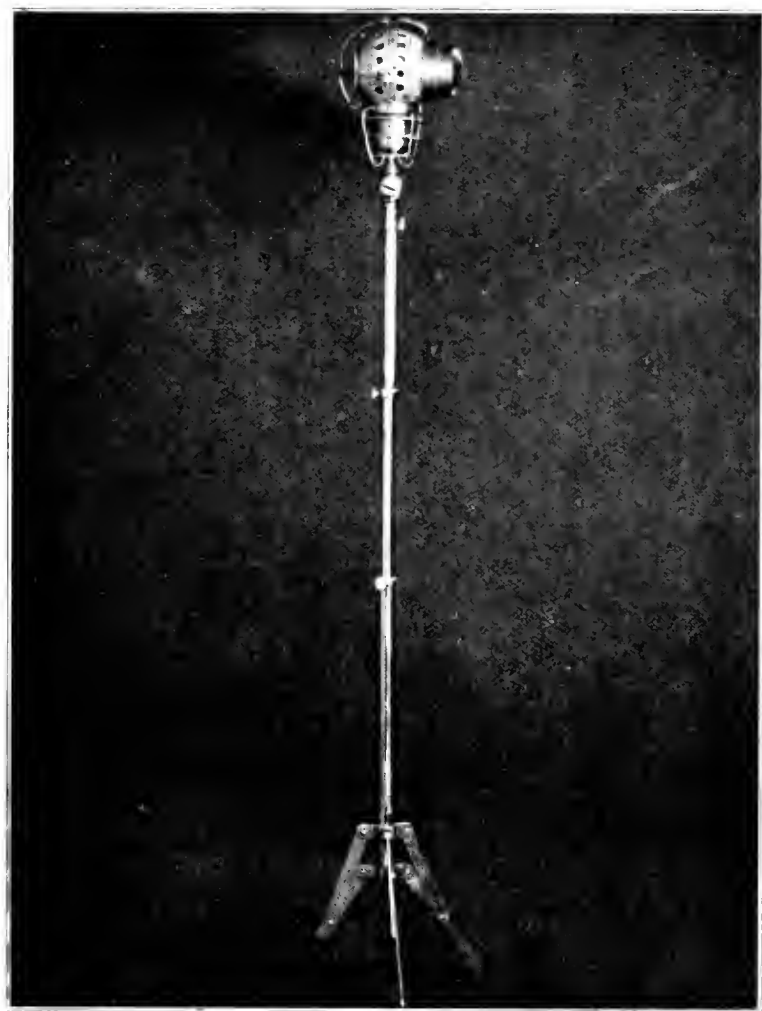


Fig. 1

can be reduced to about 18 inches in length or extended to the height of 6 feet. The fact that it can be lowered to 18 inches in length allows the physician to carry it in his bag. The lamp is a stereopticon of 100 watt, the light is intense and gives great illumination, the focal distance being about 20 inches. The lamp can be turned at any angle and

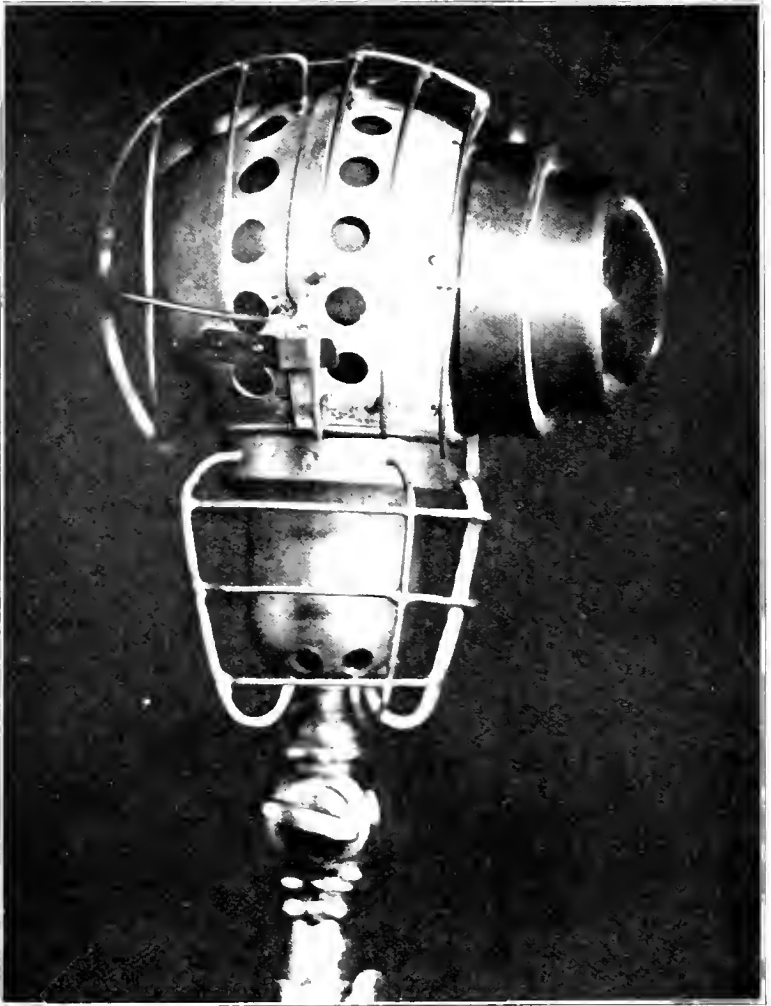


Fig. 2

used in office routine work or at the bedside or in the hospital. The objection to most hospital and office lamps is that they are not powerful enough for Ear, Nose and Throat work; also, someone has to hold them, which is a great disadvantage. It is made of aluminum and brass. The stand is patterned on that used by musicians, the legs folding up. Mueller & Company will have the lamps on the market in a few weeks.

## APPARATUS FOR TESTING MUSCLE BALANCE

NELSON M. BLACK, M.D.

MILWAUKEE, WIS.

Dr. Nelson M. Black showed an apparatus for the use of a light for testing muscle balance in the near, which he has employed for several years. As a light and a Maddox rod are used for determining the muscle balance for the distance, there is every reason why the same procedure should be used for the near. The apparatus consists of a DeZeng hard rubber ophthalmoscope handle with detachable cord, a lamp and the transilluminator cap. At about the middle of the latter a one-half mm. hole is drilled, and directly opposite a one mm. hole. The handle is attached to the slide on the card holder of the optophorometer by a clip and set at 33 mm. from the eyes and the balance of the



DeZeng Hard Rubber Ophthalmoscope Handle and Lamp, with detachable cord.



$\frac{1}{2}$  mm.  
Opening

Transilluminator Tip.

lateral and vertical muscles tested in the same manner as in the distance. This use does not interfere with the transilluminator being used for its normal purpose, or for oblique illumination.

The same apparatus is used for the distance, only the cap has a solid top so no light will be thrown on the test chart to which it is attached and the hole is 2 mm. in size. It has been found that much more accurate estimation of the degree of heterophoria is obtained with a small spot of light than with a large. With

a 10 mm. spot of light an error of from 1 to 3 prism diopters has frequently been observed with the average patient, who, as we know, is not a careful observer. The determination of abduction, adduction and circumduction with the small light is much more quickly done, and is more accurate. It is suggested if muscle tests are made uniformly with Maddox rods and lights in the near as well as in the distance, and with a  $\frac{1}{2}$  mm. light for near and a 2 mm. for distance, we should have much more uniformity in our case histories and reports.

#### DISCUSSION

DR. F. PARK LEWIS, Buffalo: With regard to the spotlight of Dr. Nelson Black, I had the Welch people make a cover that slips over the top of their ophthalmoscope which has six or eight openings and serves conveniently for getting that small light.

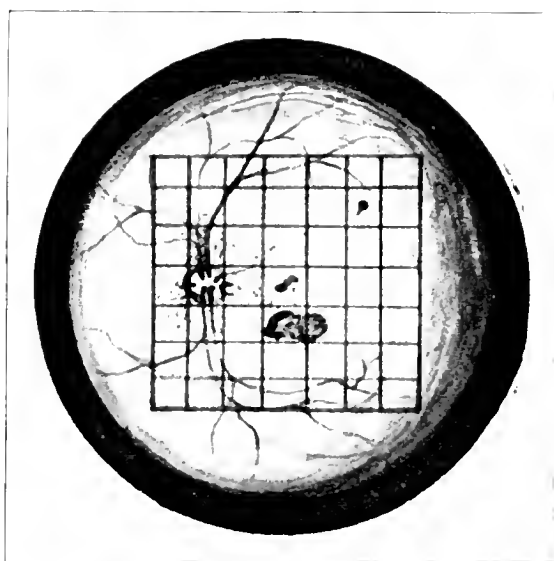


## A LENS FOR MEASURING AND RECORDING EYE GROUND DETAILS

F. PARK LEWIS, M. D., F. A. C. S.

BUFFALO, N. Y.

It is sometimes difficult to relocate a small area that has been observed in the eye-ground. That this may be done more quickly, the lens used for the indirect examination may be etched in squares of 3 millimeters diameter. These do not interfere with



the clearness of view but being shadowed on the retina definitely indicate the exact spot in which the exudate, hemorrhage or other detail is found. It will also serve as a standard of measurement of the increase or diminution of active pathologic processes in the retina or choroid. After being noted the findings may be indicated on a similar diagram on the record card. The sketch was very kindly made for me by Dr. W. H. Phillips.

## MODIFICATION OF TONSILLOTOME

S. H. LARGE, M.D.

CLEVELAND, OHIO

I have here a modification of the "LaForce Tonsillotome" gotten up by one of my assistants, Dr. T. E. Walker. We have used it in over 500 cases and like it very much. I think it is a distinct improvement on the LaForce instrument.

TRANSACTIONS  
OF THE  
TWENTY-FIFTH ANNUAL MEETING  
OF THE  
American  
Academy of Ophthalmology  
and Oto-Laryngology

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NECROLOGY  
MINUTES

### Requiescant in Pace

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DR. ADOLF ALT, St. Louis, Mo.

DR. JOHN H. BARNES, Enid, Okla.

DR. MICHAEL BEHRMAN, Covington, Ky.

DR. LUTHER Z. BREAKS, Terre Haute, Ind.

DR. F. J. BOWLES, New York City

DR. J. L. GOUX, Detroit, Mich.

DR. CHRISTIAN R. HOLMES, Cincinnati, O.

DR. HENRY HORN, San Francisco, Cal.

DR. ARTHUR J. LANCE, Portsmouth, N. H.

DR. S. H. LUTZ, Buffalo, N. Y.

DR. HOWARD E. PYFER, Norristown, Pa.

DR. SAMUEL D. RISLEY, Philadelphia, Pa.

DR. W. K. ROGERS, Columbus, Ohio

DR. EDGAR R. RUSSELL, Asheville, N. C.

DR. FRANCIS VALK, New York City

DR. W. D. VAN NOTE, Lima, Ohio

DR. J. S. WYLER, Cincinnati, Ohio

## NECROLOGIC MEETING

DR. J. C. BECK, CHAIRMAN

DR. J. C. BECK, Chicago: It has been the custom for the necrologist to make a report on the deaths of the various members of the Academy who have passed away during the year, whose names appear on the first page of the program. I have thought it more fitting that we meet together, and each one who knew these men speak of their life and attainments or any little incidents of these men they may know. I have hoped to have this made a regular thing on the program each year, with a special place for it on the program.

The first name is that of **Dr. Adolph Alt**, St. Louis, one of the earliest members and an originator of this society.

DR. HAL FOSTER, Kansas City, Mo.: It was my pleasure to know him many years. When this Academy was first thought of, he was about the first man I wrote to and asked him if he thought it advisable to organize a society of this sort. He thought it a splendid idea. I do not think he missed a meeting for twenty years. He always did all he could to make it a success. He lost his health five years ago and died this past year. I received a nice note from his wife and son after his death. I wrote them we had lost a good and enthusiastic member. He was President of the Academy for the first two years.

DR. W. D. BLACK, St. Louis: While I am not doing ophthalmologic work, years ago I had the pleasure of being associated with Dr. Alt for three or four years. As you all know, he was one of the most profound thinkers on the pathology of the eye, also a first class clinician. He was considered by those who knew him intimately as being one of the most proficient and illustrious ophthalmologists in the United States. He was always enthusiastic about the younger men in the profession taking up the work, always took time to help them and show them the right road, and especially in the clinical work was he ever ready to help the students. I will say that many of the students misunderstood him, thinking him a little rough, when in reality he was a very good teacher. He frequently would tell a student to examine an eye and tell what he saw, and then when the student would describe con-

ditions not present he would ridicule him in a way that would make it stick with him through life.

He was also very particular about people getting into the clinic who were not supposed to receive charity. I remember an instance of a lady dressed in silks and diamonds, and I called his attention to her, and he asked her what she was doing there, receiving charity. Her explanations were not satisfactory and he took her by the arm and led her to the door and told her she was not entitled to receive charity which was intended for the poor. He would not allow the clinic to be imposed upon to the detriment of the profession.

He enjoyed his cigar, and he also was a fine musician and could play classical music on the violin, which he seemed to enjoy very much.

**Dr. John H. Barnes, Enid, Oklahoma**

DR. A. H. ANDREWS, Chicago: I knew him very well. He was one of the earnest young men, a man with the courage of his convictions. I had been his teacher in Chicago. Once he read a paper on diseases of the eye in relation to nose and was getting some criticism when I came to his rescue, and after that he had a specially kindly feeling toward me and was not backward about expressing it, so I have had a very kindly feeling towards Dr. Barnes and was exceedingly grieved when I heard of his passing away.

DR. J. C. BECK, Chicago: Dr. Barnes once spent a month or two at my clinic. I was in telegraphic communication with him during his illness. He had an unusual septic condition from which he died.

**Dr. Michael Behrman, Covington, Ky.**

**Dr. Luther C. Breaks, Terre Haute, Ind.**

**Dr. F. J. Bowles, New York City**

**Dr. J. L. Goux, Detroit, Mich.**

DR. J. C. BECK, Chicago: I knew Dr. Goux fairly well. He attended the meeting in Denver and I met him several times at my clinic. He was quite active in Detroit, and has a brother practicing there now. He suffered from a neurotic infection from which he died.

A MEMBER: I met him at the meeting of a society in Windsor, Canada. The hotel accommodations were very bad

and I found him wandering about without a place to stay and took him in, and have seen him frequently since. He began in Pontiac, was one of the medical officers in the state hospital for the insane, and afterwards went to Detroit and was a surgeon in Grace Hospital, one of the thorough-going ophthalmologists. He died from Bright's Disease.

#### **Dr. Christian Holmes, Cincinnati**

DR. G. F. COTT, Buffalo: Dr. Holmes was one of the most prodigious workers I ever knew. He worked from early morning to late at night. I never saw a man stand such a tremendous strain. When Dr. Neuman of Vienna visited here some years ago he told me he had seen many a man work in his day, but never yet met one who could perform as Dr. Holmes had done. His operations were mostly concentrated on Wednesdays when he would begin early in the morning and operate throughout the day until 10 o'clock at night. He was also an indefatigable worker in other fields. He gathered millions to build the Cincinnati Hospital and at the dedication exercises he was preparing to go to New York to gather another million to add a medical school to the hospital. When he married into the Fleischman family, the story was told by a medical wag, that this was one of the time when a Jewess became an inmate of one of the Christian Holmes.

DR. ALLEN GREENWOOD, Boston: Dr. Holmes entered the service of his country when he was not a young man and did excellent constructive work at Camp Sherman. The building up of the clinic there and teaching the younger men in the surgery for soldiers was one of the most important works of his life.

DR. BECK: I was intimately acquainted with Dr. Holmes. He was President of this Academy when I received a letter from him inviting me to join it. I think no one but Ballenger knew about my being an Oto-Laryngologist, and if he had not invited me I might not have been a member of this Academy.

#### **Dr. Henry Horn, San Francisco, Cal.**

DR. L. LEVY, Memphis: I knew Dr. Horn well and was indeed shocked to learn of his death. He was a scientific worker, following the principles he believed, regardless. In my experience with him in the service during the war I found

he was always ready to help the younger men, and know those that knew him will be grieved to learn of his death.

**Dr. Arthur J. Lance**, Portsmouth, N. H.

DR. J. G. PARSONS, Sioux Falls, S. D.: I knew Dr. Lance quite well, and recall with pleasure visits I had with him during summer vacations in New Hampshire. He was a quiet man, very kindly, and held in high esteem by the practitioners of that part of New England.

**Dr. S. H. Lutz**, Brooklyn

DR. J. C. BECK: He belonged to the Triological and was always present at every meeting, and was also a member of this Academy.

**Dr. Howard E. Pyfer**, Norristown, Pa.

DR. G. F. COTT, Buffalo, N. Y.: He was an enthusiastic member of the Academy for many years. He lived in a small town, and he told me, in discussing tonsillectomy one time, that he could not seem to do the work in his town as they do in other cities. He said every eye was watching him. If he left a piece of tonsil the whole town would know it. He could not trust to the Sluder method but had to dissect carefully. We were good friends though I got on his nerves once. Dr. Beck in discussing a paper was so put out at a statement a colleague made that he said "Can you beat it?" Dr. Beck advocated a burr in the nose, which seemed almost sacrilege to Dr. Pyfer who claimed the burr might slip and cause irreparable injury. In further discussion I told Dr. Pyfer that a burr has no right to slip therefore I would apply to him the words of Dr. Beck and say "Can you beat it?"

Dr. Pyfer was a genial, wholesouled fellow and a good scout. The Academy has a distinct loss in his death. He contracted tuberculosis which finally ended his career.

**Dr. Samuel D. Risley**, Philadelphia

DR. G. F. KEIPER, Lafayette, Ind.: I remember the late Dr. Wendell Reber, a member of this Academy, once introduced him as "Risley of America." He was the best known of ophthalmologists. I have known him since I began the practice of medicine and always when in Philadelphia I called upon him to pay my respects. He was always exceedingly kind to the younger men and willing to help them out. I never



lost an opportunity to see him operate and work at Wills Eye hospital.

DR. L. M. FRANCIS, Buffalo, N.Y.: Risley was so well known as an authority that no one can express the tremendous admiration that all felt for him and the great loss we have experienced in his death.

DR. ALLEN GREENWOOD, Boston: I cannot refrain from calling the attention of the members to the character of Samuel Risley. He was one of the most careful and acute observers and one of the sweetest and kindest characters which it has been my privilege to know. For twenty years he went out of his way to speak to me to show that spirit of friendliness to the young man which means so much in this Academy. I do not think any name in our annals will last longer than his.

DR. C. W. HAWLEY, Chicago: Two men I have always loved, Charles T. Parks of Chicago and Samuel Risley of Philadelphia. I have known him for nearly thirty years. When I first started I went to Philadelphia and received the most courteous treatment possible from Dr. Risley. Those two men I never knew to say a word against another man anywhere, any time.

Dr. W. K. Rogers, Columbus, O.

Dr. Edgar R. Russell, Asheville, N. C.

Dr. Francis Valk, New York City

DR. ANDREWS: Dr. Valk was one of my first teachers in 1892, when I spent some time in New York. I hardly see how Dr. Valk could have had the patience to show me the things he did. I have always had the kindest of feelings towards him, and as I have met him in later years I found that same kindly consideration for young men who were trying to learn.

Dr. W. D. Van Note, Lima, Ohio

Dr. J. S. Wyler, Cincinnati, O.

Dr. John J. Kyle, Los Angeles, California

DR. G. F. KEIPER: Dr. Kyle was an Indiana product. He first practiced in Anderson. Was a surgeon in the 159th Indiana Volunteers in the Spanish-American war. He moved to Indianapolis and afterwards to Los Angeles. One phase of his character was that he gave one hour of every day to medical writing. That is a thing that ought to go out to every member of the society, because as a result he has published two books and a

compendium of the ear, nose and throat. In this matter he has left for us an example worthy of emulation.

DR. J. C. BECK related an incident where he, with Stein, Ballenger and Levy were motoring, and were directed on a long detour by a man in a village, only to find they had been misled purposely by this man, who had sent many others in this way the same day. Kyle was so angry that he said he was going back and whip this man to a finish, but was dissuaded by the others from doing so. It merely went to show that he was willing to fight a good fight if necessary.

#### Dr. J. E. Sawtell, Kansas City

DR. MEYERS: I do not know any person who was more closely in touch with Dr. Sawtell than myself, and there is no one except my father I think more of than him. No man drew me to him as much as he. He was a friend. A man that few were intimately acquainted with. He was a bashful man. He made his own way. A poor boy, he worked his way through college and medical school, starting in practice in Western Kansas; then going to New York and working with a specialist, then coming to Kansas City and working up, fighting every step of the way. He was so reserved that one never knew him until he had been with him for years. One thing he enjoyed the most was attending the meetings of this society.

## MINUTES

The twenty-fifth annual meeting of the American Academy of Ophthalmology and Oto-Laryngology was called to order by its President, Dr. Lee Masten Francis, at the Hotel Muehlebach, Kansas City, Mo., at 10:15 A. M., Thursday, October 14, 1920.

On motion of Dr. Suker, duly supported, the reading of the minutes was dispensed with and same accepted as printed in the Transactions.

The Secretary, Dr. Luther C. Peter, made the following report:

October 14, 1920.

Mr. President and Fellows of the Academy:

The Academy has on its membership roll 1,163 names. At the meeting in Cleveland there were 117 names favorably acted upon by the Council.

During the year the Academy has suffered a considerable loss in the death of 17 of its members. They are: Drs. Adolf Alt, John H. Barnes, Michael Behrman, Luther Z. Breaks, F. J. Bowles, J. L. Goux, Christian R. Holmes, Henry Horn, Arthur J. Lance, S. H. Lutz, Howard E. Pyfer, Samuel D. Risley, W. K. Rogers, Edgar R. Russell, Francis Valk, W. D. Van Note, J. S. Wyler. All of these men have been active factors in the affairs of the Academy. We should not fail to mention in passing at least four who attained to unusual distinction in the profession. Dr. Adolf Alt, the last to pass away, was the first president of this organization. Aside from the initiative and enthusiasm of Dr. Hal Foster in issuing invitations to those who met and organized the W. O. O. L. Society in 1896, to Dr. Alt is due perhaps more than to any other single individual, the credit of launching the Academy on its successful career. What he did for the Academy, in its earlier years, what he accomplished as an ophthalmologist, and the influence which he wielded in a scientific and editorial capacity are well known. Although in late years he could not attend the meetings, the Academy was always close to his heart. To Dr. Alt we, as Fellows, owe a debt of gratitude not only for his contributions to the great science of ophthalmology but for his special interest and devotion in helping to shape the affairs of the Academy during its earlier years.

Dr. Samuel D. Risley of Philadelphia and Dr. Francis Valk of New York City also like Dr. Alt deserve more than a passing note. Both had attained to great eminence in the profession; both were noted for their interest in and their desire to serve the younger men in the profession; kindly in disposition, courteous in their relations with their confreres—gentlemen of the old school who have not only left an impress upon their own communities but who have earned a national and international reputation, which we all may do well to emulate. Both manifested more than usual interest in the welfare of the Academy. Dr. Risley especially was regular in attendance upon its meetings and was most appreciative of the honor conferred upon him when he was elected to honorary membership.

The fourth of the distinguished members of the Academy whose death we record is Dr. Christian R. Holmes of Cincinnati. Those of you who have been identified with the organization since its beginning will recall Dr. Holmes' activities and interest in the Academy. The minutes of the first meeting of the Society are missing and the complete list of members present at that meeting is not in the Secretary's possession. As the name of Dr. Holmes appears in the minutes of the other early meetings it is likely he was a charter member. In 1901 and '02 he was elected as President of the W. O. O. L. Society. In 1903 he was elected to the first Council incorporated under the new constitution adopted by the newly christened society, The American Academy of Ophthalmology and Oto-Laryngology. Dr. Holmes was a distinguished ophthalmologist and oto-laryngologist, a clever operator, and like Drs. Alt, Risley and Valk, a well known teacher. In the death of these distinguished men of science the Academy has sustained a great loss.

The report of the Secretary for this 25th year of the Academy would not be complete were he to omit the enumeration of a few important events which have reached their culmination during this year.

In the first place it is with no small degree of satisfaction that we can point to the remarkable growth of the organization in the 25 years of our existence. As announced, our membership roll now numbers 1,163 names. While numbers alone are not a most important factor in success, I need not remind you that in this number are included the very best in our

specialties in the American profession. Furthermore from a purely local society known originally as the W. O. O. L. Society the Academy now is the representative American Society including the East as well as the West, reaching North into Canada as well as throughout the South.

Secondly, the financial stress which was in evidence in the early history of the Society is no longer a source of worry to our Treasurer. The treasury, though far below the mark set by all who are vitally interested in the future of the Academy, now warrants the long felt need of the Council to contribute in a substantial way to stimulate original investigation and study in our special branches. During this year a sum not to exceed \$500 was set aside for the use of the Commission on Iritis in their original studies and research into the etiology of iritis. This is the beginning of a most important function of the Academy.

The third important event in the history of the Academy which will reach its consummation this year is the establishing of a higher standard of entrance requirements. From the time of its inception, April 9, 1896, in Kansas City, the Academy has stood for a high standard in the scientific qualifications of its candidates for membership. In the second year a three-year preparation was required of its candidates before they could apply for membership. It is most gratifying, therefore, that the Academy should be one of the pioneers in urging and insisting that specialists in eye, ear, nose and throat diseases should be properly qualified to practice these specialties. The new requirements for those who enter as ophthalmologists will be operative January 1. The Committee of the Oto-Laryngologic Section is prepared to report finally at this meeting. Thus in our 25th year we find ourselves perpetuating and perfecting a policy which was inaugurated in the second year of the Academy's existence. These are not the only evidences of progress in the growth of the Academy but they are events worthy of note on this, our 25th anniversary.

An unusually large number of applications have been received this year. The list of applicants is posted upon the bulletin board. It is urgently requested that this list shall receive your most careful consideration. Your recommendations will greatly assist the Council in passing upon the applicants. If there are any other applications to be presented they should be handed to the the Secretary promptly together

with a remittance of \$10 in order that their names may be posted for 24 hours as required by the By-laws, and that they may be acted upon at this meeting.

Respectfully submitted,

Luther C. Peter, Secretary.

On motion of Dr. Suker, duly supported, the report was adopted as read.

The Treasurer's report was read by Dr. S. H. Large, as follows:

Statement for year ending October 11th, 1920

Balance on hand from 1919—Cash.....	\$ 5,839.89
Liberty Bonds.....	7,000.00
	<hr/>
	\$12,839.89
Receipts for 1920.....	13,476.42
	<hr/>
	\$26,316.31
Disbursements for 1920.....	4,957.06
	<hr/>
Balance .....	\$21,359.25
Cash in bank.....	\$14,359.25
Liberty Bonds .....	7,000.00
	<hr/>
Total ..	\$21,359.25

On motion, duly supported, same was accepted and the Chair asked to appoint a committee to audit report.

The president appointed as Auditing Committee

Dr. Bruner, of Cleveland.

Dr. Newcomb, of Indianapolis.

The Necrologist, Dr. Jos. Beck, said he would like to have a suitable time and place appointed for the purpose of gathering together and having those who had personal acquaintance with the members who had died during the year tell what they could of their work and character, rather than have one man make the entire report.

The time and place for such meeting would be announced.

## REPORT OF COMMITTEES

## COMMITTEE ON STANDARDIZATION OF THE CURRICULUM FOR OTOLARYNGOLOGY

DR. BECK: Although the entire committee has never met, Dr. Carmody and I have met on several occasions and are prepared to report progress to the extent that we would like to follow the Committee on Ophthalmology were it not that we are in a somewhat different position, owing to the fact that the Oto-Laryngologists are represented by five different societies, and there is a committee in these societies which is working with great progress, as reported at the last meeting in Boston, along the lines of higher standardization. Your chairman of this committee had the privilege of being one of the members of that committee as representing this society. This large committee is very much encouraged by the attitude this society is taking towards higher standardization, and if we can follow the ophthalmologic section of this Academy, we will be pleased to do so. This is merely a preliminary report, and when Dr. Ingersoll has met with us we will make a subsequent report.

PRESIDENT FRANCIS: This is one of the most important matters under consideration of this Academy. I had hoped this committee would give us a definite report. Dr. Ingersoll is not coming. The provision has been made that no man shall be eligible unless he has passed the ophthalmologic board. That leaves us lop-sided. He can be accepted through the laryngologic section and be refused on the ophthalmologic side. We must either change our policy or have this committee ready to report on recommendations.

DR. BECK: I have taken this up with Dr. Suker and Dr. Gradle, and questions have come up in which we have felt that the Council should take this matter up and report as to what the action should be. Dr. Ingersoll and Dr. Carmody have not been able to meet, so that little has been accomplished, so I feel that if the Council will meet the committee a much more satisfactory and definite plan can be arranged. There seems to be a difference of opinion as to following the plan of the ophthalmologic section, and one of the members of the Council can give you all the information necessary.

DR. SUKER: I would like to move that the Council take this under advisement and report results, definitely, at this meeting. Motion seconded and carried.

REPORT OF THE COMMITTEE ON AN INTERNATIONAL CONGRESS OF  
OPHTHALMOLOGY

At their several meetings in 1919, the American Ophthalmological Society, the Ophthalmic Section of the American Medical Association and the American Academy of Ophthalmology and Oto-Laryngology each appointed a committee of three members instructed to formulate plans for the organization of an International Congress of Ophthalmology to meet in this country.

From the American Ophthalmological Society, Drs. G. E. de Schweinitz, W. H. Wilmer and Frederick Tooke.

From the Ophthalmic Section of the A. M. A., Drs. W. H. Wilder, Lucien Howe and Francisco Fernandez.

From the American Academy of Ophthalmology and Oto-Laryngology, Drs. Edward Jackson, W. B. Lancaster and Luther C. Peter.

These committees met in New York October 21, 1919, and effected an organization of the combined committees, as follows: Dr. G. E. de Schweinitz, Chairman; Dr. Edward Jackson, Vice-Chairman; Dr. Luther C. Peter, Secretary.

By direction, a temporary Sub-Committee on Time and Place was appointed, as follows: Drs. W. H. Wilmer, W. B. Lancaster and the Chairman. This Committee met in Washington and resolved to recommend Washington as the place of meeting, and April as the month.

After the submission of their recommendation at several later meetings of the General Committees, it was resolved that Washington should be the place of meeting, and the last Tuesday in April, 1922, as the time of meeting. The exact time, however, is subject to revision, according to further advices from abroad. The Chairman was authorized to appoint the following Sub-committees:

1. Committee on Organization, Dr. E. C. Ellett, Chairman.
2. Committee on Finance, Dr. Lee M. Francis, Chairman.
3. Committee on Scientific Business, Dr. Edward Jackson, Chairman.
4. Committee on Membership and Credentials, Dr. Walter R. Parker, Chairman.
5. Committee on Arrangements, Dr. W. H. Wilmer, Chairman.



The personnel of these Committees has been selected to represent all sections of the United States, as well as Canada, Cuba, Mexico, Central and South America. Three well-attended meetings of these Committees have taken place, as follows: In Philadelphia, March 6, 1920; in New Orleans, April 27, 1920; in Hot Springs, Va., June 15, 1920, and complete reports of the various Committees and Sub-committees were presented.

It has been resolved, if the work of the Committee is accepted, to issue invitations as speedily as possible to join this Congress to physicians (ophthalmologists and others interested in ophthalmology) in good standing in the American Medical Association, or other recognized scientific and medical societies of the United States and Canada, and to physicians (ophthalmologists) in good standing in Cuba, Mexico, Central and South America, and also to physicians through their constituted ophthalmologic societies in those foreign countries with whom we are (March 6, 1920) in diplomatic relationship.

It was further resolved that the official language of the Congress shall be English, French and Spanish, and that the membership fee shall be ten (10) dollars in United States money.

Much work has been done in relation to organization, arrangements of the scientific business and membership, and certain plans looking to the financing of the enterprise have been submitted and adopted.

The Report of the Committee, as far as it had proceeded, was received and accepted by the Ophthalmic Section of the A. M. A. in April, 1920, and by the American Ophthalmological Society in June, 1920. It is now presented to the American Academy of Ophthalmology and Oto-Laryngology for action. From time to time bulletins will be issued informing those interested of the progress of the work. The cordial support of the members of the Academy is earnestly requested.

G. E. DE SCHWEINITZ,

Chairman of the General Committee.

DR. DE SCHWEINITZ: As you know, the American Academy of Ophthalmology and Oto-Laryngology, the Section of the American Medical Association and the American Ophthalmological Society have each appointed committees to take under consideration the development of an International Congress of Ophthalmology. These gentlemen met in the Fall of

1918 in New York and formed an organization of which the present speaker was made Chairman, Dr. Jackson, Vice-Chairman and Dr. Peter, Secretary. The Chairman was asked to appoint a committee on time and place, which committee met in November of that year and tentatively proposed Washington as the place of meeting and possibly the Spring of 1922 as the time. Since that time several committees have been appointed: On Organization, with Dr. Ellett as chairman; Finance, Dr. Francis, chairman; Arrangements, Dr. Wilmer; Credentials, Dr. Parker; Scientific, Dr. Jackson. These committees have been considerably enlarged, and it has been the endeavor of the general chairman to so study the personnel of the committees that the country shall be geographically represented. Meetings have been held in New Orleans and Hot Springs, and here in Kansas City, and considerable work is accomplished. I have communicated officially and sometimes privately with men abroad and have gained the impression that 1922 will be an acceptable year and it has been so ordered. It will probably be the last part of April. The committee on Credentials and Membership has done a great deal of work. The country has been divided into districts and men appointed to take care of these districts and now the question as to invitations will come up and we will ask from all the nations with which we are at present in diplomatic relations. South America, Central America, Cuba, Canada have shown unusual interest. Dr. Peter has recently been abroad and will tell you what he learned there. Certainly he did not find any lack of appreciation, although the difficulties of the situation are many. It has been decided that the language of the Congress shall be English, French and Spanish. Dr. Jackson and his committee are elaborating the scientific program. The invitations will probably go out within the next few weeks. I offer apologies that this is not a written report. I wish to urge your earnest enthusiastic and undivided support. It is an unusual opportunity for America and I have no doubt of undivided sympathy back of it. It would not do to start a congress of this sort and have it fail.

PRESIDENT FRANCIS: This is of great importance to the Academy, especially the ophthalmologic side of it. I do not know that any formal resolution in regard to it is necessary.

DR. DE SCHWEINITZ: It is my impression that it was according to the original resolution, to report back to the vari-

ous societies and receive endorsement or otherwise. So I move that the report on the International Congress be accepted and approved.

The motion was seconded and carried.

#### REPORT OF THE COMMITTEE ON A NATIONAL MEDICAL RESEARCH LABORATORY

The resolution according to which this committee was appointed provided that a report should be made at "some subsequent meeting."

As the subject is so important, suggesting the necessity of some cooperation this committee desires at present, simply to report progress.

Respectfully submitted,

LUCIEN HOWE,

EMIL MAYER,

EDWARD B. HECKEL.

Report of Dr. Mayer accepted, and committee continued.

#### REPORT OF COMMISSION FOR THE INVESTIGATION OF IRITIS AND IRIDO-CYCLITIS

The commission wishes only to report progress. Circular letters have been sent to 200 members of the Society and to date only 6 have responded by sending in syllabi. Eighty case reports have been received. This number is too small to be of statistical value, and no definite conclusions have been drawn. We have made the syllabi for the investigation of this subject as complete as possible, but we do not expect them to be filled out completely by all. A well worked out case, with notations of the investigation even though not covering the complete field will be of value to us. The Commission to accomplish its end needs several hundred case reports. These reports must be drawn from members of the Society. We need the cooperation of men with laboratory facilities to assist us, and volunteers are solicited to aid in the investigation. From the study of the meager data which we have obtained, we find that focal infection plays a very important part in the etiology of Iritis. In investigating cases in which focal infection is

suspected as the cause, animal inoculations with cultures obtained from the infected area, are of greatest importance.

Respectfully submitted,

JOHN GREEN, JR.

WILLIAM L. BENEDICT.

WILLIAM C. FINNOFF, *Chairman.*

#### COMMITTEE ON SCIENTIFIC DEMONSTRATIONS AT MEETINGS

DR. JACKSON: At the meeting in Pittsburgh, three years ago, a committee was appointed to consider, and if practicable, to arrange for educational demonstrations in connection with meetings of this Academy. The next year, our country being in the midst of war, and the meeting of the Academy being decided on only three weeks before it was held at Denver, it was not practicable to carry out this purpose. Last year conditions seemed no more favorable for the inauguration of such a movement at the Cleveland meeting.

This year, with the assistance of Dr. Wm. C. Finnoff, and the excellent facilities placed at our disposal by Prof. Curran and the Medical Department of the University of Kansas in the Laboratory Building at Rosedale, Kas., it became possible to carry this idea into effect.

On the afternoon of the day before this meeting, as announced in the program, using between forty and fifty microscopes furnished by the institution mentioned, the following microscopic slides, placed on exhibition, were demonstrated throughout the afternoon by Dr. Finnoff; trachoma, 3 slides; panophthalmitis, buphthalmos, 2 slides; early glaucoma, traumatic discoloration of lenses, vitreous hemorrhage and detachment of retina, phthisis bulbi following penetrating wound, seclusion of pupil and anterior polar cataract, foreign body giant cells around cholesterol crystals, albuminuric retinitis, chronic irido-cyclitis and secondary glaucoma, healed perforating wound, anterior staphyloma, panophthalmitis following perforating wound, perforation of cornea with incarceration of iris, cell proliferation in vitreous, posterior, chronic glaucoma, 2 slides; papilledema and section of macula, chronic iritis, coraliform cataract, section of conjunctiva, tuberculosis of conjunctiva, glioma of retina, 2 slides; melanosarcoma of ciliary body, fibrosarcoma of optic nerve, extradural metastatic carcinoma of orbit, melanosarcoma of caruncle, 2 slides, papilloma of caruncle, epithelioma of bulbar conjunctiva, epithe-

lioma of lower lid, plaque from conjunctiva in case of vernal conjunctivitis.

The educational value of hours spent in looking at such slides can scarcely be overestimated. Arrangement was also made for demonstrating visual tests. But less than twenty persons visited the whole demonstration. It may be argued that even with such a small attendance such a demonstration was justified. With as good facilities and better advertising of the opportunity, ten times as many might have availed themselves of it. The scope of such a demonstration could be doubled by covering the field of oto-laryngology, and could be extended in many directions. This matter is strongly recommended to the attention of the members and of future local committees of arrangements.

DR. BECK: I move that this report be accepted, and wish to make a few remarks in reference to the recommendation made. I certainly feel it important that this section follow and think in the next year the committee appointed should have another member representing the oto-laryngologic section, so that the work can be made as big as Dr. Jackson says it should be. I see a great possibility not only in pathology but in the demonstration of the use of modern appliances in oto-laryngology.

DR. GROSVENOR suggested that it be put in the preliminary program.

DR. PARKER: I suggest that the time for inspection be put after a regular session on one of the regular days. It was quite by accident that these twenty were here on the day before.

DR. GREENWOOD: At the meeting of the Council last year I brought up this question, which is very close to me, and I will make a motion now that this matter be referred to the Council, that we have our meetings on Monday, Tuesday, Wednesday, and that on Thursday, Friday and Saturday we give intensified courses in instruction occupying these other days. We have men among us that could give such courses that would be helpful to many.

I make a motion that this report be accepted and placed on file, and referred to the council for action at this meeting.

DR. STUCKY: I wish to second this motion and to emphasize it by saying that in so doing this great society simply

carries out the meaning of the first word in its name, the academy feature of it.

DR. ANDREWS: Would it not be a good thing to continue this committee to work with the council. I offer that as an amendment. The Treasurer's report struck me as proving that the Academy is ready to stand back of some really scientific advance. The response made when we doubled our annual dues for the purpose of supporting scientific work proved that the Academy is ready to start some real advance.

Motion was carried.

DR. F. PARK LEWIS: We have with us today Mr. Eton, who is the Secretary of the National Association for the Prevention of Blindness. Mr. Eton tells me that one of the purposes of this association is to recommend to various state legislatures measures to be enacted for the prevention of blindness. That is a matter of such vital importance that it seems such recommendations should not be made as to the measures to be taken for the prevention of blindness until they have received the approval of the ophthalmologists of this country. I would move that a committee of this association should be appointed to make such recommendations, which, I am advised, the National Association will be glad to act upon, in order that there will be uniform recommendations made as to the prevention of blindness resulting from ophthalmia neonatorum.

The motion was seconded.

DR. SUKER: I think there is already such a committee, appointed several years ago, which has not been discharged.

DR. GREENWOOD: I would not leave the motion as put, so that this refers only to the blindness resulting from ophthalmia neonatorum, but to all blindness.

The motion with Dr. Greenwood's amendment, was carried.

DR. HAYS: I am very glad Dr. Lewis brought this matter up because it gives an opportunity for mentioning a committee for the care of deaf children and deaf adults. Dr. Wendell Phillips has brought this up in the A. M. A. with the result that the committee on deaf children has been enlarged to include the deaf adults, and in Boston this was brought up in the Triological Society, and committees have been formed in all these societies to take up this matter. I am sure if Dr. Goldstein were here he would make this suggestion. Many of us are interested in this, and I

should like to make a motion that a committee of this Academy be appointed for the investigation of the problems of deafness. Motion seconded and carried.

DR. GREENWOOD: The Council last night passed a resolution commending the work of Dr. Loeb in his excellent efforts relative to our Transactions. Dr. Loeb has done some excellent and wonderful work, and the Council wished to take this manner of expressing appreciation of his efforts.

Several telegrams from absent members were presented, whereupon the Scientific Work of the Academy was taken up.

#### FRIDAY MORNING SESSION

President called for report of Committee on Incorporation.

DR. HECKEL, Chairman: At Cleveland the matter of incorporating the Academy was agitated and a committee was appointed. This committee has carefully considered the question and begs to make a negative report. Signed by Drs. Dayton, Heckel, Peter.

On motion of Dr. Jackson, duly supported, the report was accepted and committee discharged.

#### REPORT OF THE SENIOR MEMBER OF COUNCIL

DR. GREENWOOD: The first report of the Council is the nomination of officers:

For President—Dr. Emil Mayer, of New York.

First Vice-President—Dr. Jno. R. Newcomb, of Indianapolis.

Second Vice-President—Dr. R. F. Ridpath, of Philadelphia.

Third Vice-President—Dr. W. C. Finnoff, of Denver.

Secretary—Dr. Luther Peter, of Philadelphia.

Treasurer—Dr. S. H. Large, of Cleveland.

Editor of the Transactions—Dr. Clarence Loeb, of Chicago.

Council—Dr. Edw. C. Ellett, of Memphis, and H. Newhart, of Minneapolis.

By unanimous vote of the Council, the Academy will elect at this meeting an Oto-Laryngologic Board to pass on all members. This board shall conduct examinations for membership in this Academy. One examination shall be held just preceding our annual meetings. This board shall act until such time as its functions shall be taken over by the American Board of Examiners in Oto-Laryngology, or until

discharged by this Academy. This must be acted upon before we can bring forward the names of the men we have asked to serve on this board. Your president will entertain a motion on the part of any member concurring with the action of the Council creating such a Board.

On motion, duly supported, this report of the Council was adopted.

DR. GREENWOOD: The Council have named the following as members of that Examining Board: Drs. Beck, Carmody, Ingersoll, Mosher, Lynch, Skillern.

On motion duly supported, the nominations were accepted.

DR. GREENWOOD: The meeting place for next year is Philadelphia, and the time will be announced after conference with the Philadelphia men.

Amendments to the Constitution and By-Laws were next considered.

On motion of Dr. Jackson, Article 3, as printed in the Program was adopted, as follows:

#### Article 3. Fellowship.

(a) A candidate for active fellowship shall be a member in good standing in his or her local, county or state society. He or she shall present the regular application blank of the Academy duly filled out, endorsed by two active fellows of the Academy, at least one of whom shall be a resident of the city or state in which the candidate resides (except where there are no fellows of this society in the state) and accompanied by the entrance fee of ten (\$10.00) dollars.

On motion of Dr. Jackson, duly supported, the amendment was adopted.

Article 4, as printed in the Program was adopted, as follows:

#### Article 4. Officers.

The Officers of this Academy shall be a President, 1st Vice-President, 2nd Vice-President, 3rd Vice-President, Secretary, Treasurer, Editor of the Transactions and a Board of Councilors.

On motion of Dr. Greenwood, duly supported, the amendment was adopted.

#### By-Laws. Article 1. Annual Meeting.

On motion of Dr. Greenwood, duly supported, the article amended as it appears in the program was not adopted.

#### Article 2. Papers.



Twenty minutes shall be the maximum time allowed for the reading of a paper. The fellow designated to open the discussion shall be allowed ten minutes. In the general discussion no one shall speak more than five minutes nor may he discuss each paper more than once. All such papers shall be edited by the Editor of the Transactions.

On motion of Dr. H. W. Loeb, duly supported, this article was amended to read "Nor shall he discuss any (instead of each) paper more than once.

The article as amended was then adopted.

Article IV. Duties of Officers. The President.

He shall fill by appointment all vacancies occurring on the personnel of the committees.

To be inserted: The Editor of the Transactions.

The Editor of the Transactions shall receive all papers and reports read before the Academy with the discussion of the same, and from them, with the aid of the Secretary (and with the sanction of the Council) compile and publish the Transactions.

Adopted.

The Committees under Article V to be transferred to Article IV under Duties of Officers etc. The paragraph referring to Committee to be amended by striking out "The Publication Committee."

The Board of Councillors to be transferred from Article V to Article IV referring to duties of officers etc., and the last clause amended so as to read:

It shall appoint a successor or substitute to fill the place of an elective officer who for any reason is unable during the current year to perform his duties.

On motion, duly supported, this article was adopted.

Article VI. Dues.

Amended by striking out the second clause, to be replaced by the following: The entrance fee paid by the newly elected fellow shall cover his annual dues to January First.

On motion of Dr. C. Loeb, duly supported, the word "only" is added before the word to January First, a standing vote, being taken.

The motion as amended was then carried.

DR. JACKSON: Would offer a couple of amendments, one to put the word "exclusively" in the form of application blank,

so that it shall read (Art. 3, Sec. a) "shall have been practicing exclusively for at least" etc.

And in the same Section A after the words "the annual dues of ten dollars," "such application shall be filed with the Secretary at least thirty days before the annual meeting, and the list thereof shall be sent to the fellows with the notice of the annual meeting. This corresponds with a suggestion of the President, and it will enable every fellow of the Academy to have the list and pass on it without having to stand before the door and look over a hundred names to see if any undesirables are there listed.

The first part of the suggestion I will change to read "Shall have been practicing medicine in branches of eye, ear, nose or throat exclusively. This is simply a notice of amendments to be brought up next year.

Dr. Beck announced a necrologist meeting Saturday afternoon.

#### SATURDAY MORNING, OCT. 16, 1920

The Academy having been called to order by the President, a rising vote of thanks was extended to Dr. Foster and his committee for all they have done for the Academy in Kansas City.

It was announced that Dr. Greenwood had been nominated on the Board of Examiners in place of Dr. Lancaster.

DR. SUKER proposed that the Chair appoint a committee to have our next annual Transactions dedicated to that particular member or members whom the committee would delight to place on the roll. The only honor member we have had on our list is Dr. Risley. It would be well to show appreciation while these men still live.

THE CHAIR expressed sympathy with what Dr. Suker has said and will be glad to entertain a motion to that effect at the proper time. Election of Officers is the matter to come before us at this time.

DR. SUKER: Move that the nominations be closed and the Secretary cast a ballot for those nominated by the Council. Seconded and carried.

The Council approved the list of 227 names posted the required length of time. On motion duly supported same were duly elected members of the Academy.

DR. GREENWOOD: I wish to report on the proposed post-

graduate work which the Academy will undertake at Philadelphia. It has been practically agreed that we shall have this intensive work two or three days following the meeting. This is one of the greatest things this Academy can do. We will have Dr. de Schweinitz for intensive work, Dr. Peter for work with the perimeter. Mosher could be induced to give some of his excellent work.

THE CHAIR: This is a great occasion.

DR. MATHER, of Texas: I heartily approve this step and hope everything will be done in the way of advertising this feature of the program so that the men, especially the younger men will be induced to come to this meeting.

THE CHAIR: It is hoped that at the midyear announcement of the Academy the details will have been so arranged that the public announcement can be given. It will amount to the fact that we will have a week's meeting, the first three days devoted to these meetings and the last three days to clinical study.

It seems hardly necessary to ask the members to present themselves for examination before the Oto-Laryngological board. We are stepping out in advance in this matter, and in order that this is a success it is necessary that it have the moral support of the members. It will succeed if it has that support.

It is urged that all take an interest in the coming International Congress of Ophthalmology to be held in Washington in 1922. This is the first time in many years there has been such a congress in this country and it will need the moral and financial support of all ophthalmologists in this country. The Academy has never failed to support such movements.

A vote of thanks has been given Dr. Foster and his associates here. This is the largest and best meeting this Academy has ever had, and it is due to their untiring efforts.

DR. GREENWOOD: I expected the President would say something about this Oto-Laryngologic Examining Board. Some members are thinking it is going to cut down our membership. I am sure they will follow the example of the Ophthalmologic Board and certify men of ability and reputation without going through the process of an examination. That the Board has done for the last five years. Men whose ability we are aware of can be qualified by the Board. It is

simply as an uplift in the future so that in years to come all young men who come for the membership in the societies will have the O. K. of this Board.

DR. BRUNER: The Auditing Committee wish to report that the accounts have been audited and found correct in all details, and also we commend the Treasurer for the careful manner in which the books are kept.

On motion duly supported, the report was ordered accepted.

DR. GREENWOOD: Would move that the matter of adding names to the honor roll as advocated by Dr. Suker be left to the Council.

The motion was seconded and carried.

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OF THE

TRANSACTIONS

OF THE

FIRST TWENTY-FIVE MEETINGS

OF THE

Western Ophthalmological, Oto-  
logical, Laryngological and  
Rhinological Association

AND OF ITS SUCCESSOR, THE

American Academy of Ophthal-  
mology and Oto-Laryngology



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